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ABSTRACT

This research addressed the relationship of alternative social class measures (based on occupation) for elementary attendance areas in Kansas City, Missouri, with the median achievement of sixth graders on standardized tests. Correlation, regression, and multivariate analyses were used to study the relationships between school achievement and predictor variables (family background, neighborhood characteristics, and ability scores obtained from school profiles). Findings indicate that lower social class measures are systematically related to lower school achievement. These findings suggest the importance of social class, along with other socioeconomic measures and ability scores, as predictors of school achievement. However, additional research is needed regarding methodological issues such as time lag, change variables, and stability of predictive models. (Author/MK)

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THE RELATIONSHIP OF SOCIAL CLASS TO SCHOOL ACHIEVEMENT IN KANSAS CITY, MISSOURI, 1950-1970

A DISSERTATION IN
Education

Presented to the Faculty of the University
of Missouri-Kansas City in partial fulfillment of
the requirements for the degree

DOCTOR OF PHILOSOPHY

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THE RELATIONSHIP OF SOCIAL CLASS TO SCHOOL ACHIEVEMENT IN KANSAS CITY, MISSOURI, 1950-1970

Bruce Blake Morgan, Doctor of Philosophy
University of Missouri-Kansas City, 1979

ABSTRACT

This research was an ecological study of the relationship of social class to school achievement in Kansas City, Missouri. Specifically, the research addressed the relationship of alternative social class measures (based on occupation) for elementary attendance areas in Kansas City with the school median achievement on standardized tests of sixth graders. School achievement scores between 1957 and 1976 were explained or predicted through an analysis of social class and other socioeconomic measures obtained from Census data for 1950, 1960, and 1970 as predictors. Ability scores obtained from school profiles were also used as predictors of school achievement and compared with social class and other socioeconomic measures predictions.

This research was identified as an educational production function study. Educational production function studies have related student outcomes (e.g., school achievement) to characteristics of the students, their families (e.g., family background and neighborhood factors), other

students in the school, and characteristics of schools. The primary focus of this research was concerned with more explicitly defining what measures should be included as family background and neighborhood factors, the relationship of alternative measures to school achievement, the effects of time-lag and the dynamics of change on the relationship.

Correlation and regression analyses were used to study the relationships between the dependent variable, school achievement, and the major independent or predictor variables. Alternative social class measures and other socioeconomic measures (e.g., race, education, income, density, and housing value) were the major predictor or independent variables which represented family background and other neighborhood characteristics. An ability score was also used as a predictor to represent characteristics of the students. The unit of analysis was the elementary attendance area and all variables were interval or ratio measures representing this aggregate.

Alternative social class measures for 1950-1970 yielded similar results as statistically significant predictors of 1957-1976 school achievement in Kansas City. Lower social class measures for 1950-1970 tended to be the strongest predictors of 1957-1976 school achievement. Higher social class measures in 1950 and 1960 were stronger predictors of school achievement 1957-1976 than the 1970 predictors.

Other socioeconomic measures such as race, education, income, density and housing value were also good predictors

of school achievement but not as strong in prediction as the alternative social class measures. Different socioeconomic measures were stronger predictors over the 1950-1970 period. For example, in 1950 and 1960 predictors, education was the strongest predictor of school achievement followed by housing value, income, density, and race. By 1970, density and income were the strongest 1970 predictors followed by housing value, race, and education.

Time-lagged variables (e.g., lagging of social class and other socioeconomic measures) for 1950-1970 were statistically significant predictors of 1957-1976 school achievement but did not result in higher correlations over the unlagged relationship. Change variables (e.g., percent change in dependent and predictor variables) were statistically significant predictors of school achievement but also were less than anticipated. Neighborhood change variables were found to be useful in explaining or predicting changes in school achievement but will require further refinements before more substantive findings can be presented.

This research illustrated that lower social class measures were systematically related to lower school achievement. In 1950, 1960, and 1970, elementary attendance areas with greater than 30 percent lower working class persons were below grade level in school achievement as represented by the school median for sixth graders.

In a multivariate analysis of school achievement in 1970, social class, density, and race explained or predicted 73 percent of the variance in 1970 school achievement. In a multivariate analysis of the percent change in 1960-1970 school achievement, while controlling for 1960 achievement, the change in social class 1960-1970, density in 1960, and socioeconomic ratio in 1960 explained or predicted 66 percent of the variance in 1960-1970 percent change in school achievement. These results tentatively suggest the importance of family background and other neighborhood factors as predictors of school achievement, the use of change variables in conjunction with other predictors, and the effects of lagging of predictor variables.

Also, the research illustrated that ability scores were important as predictors of school achievement. In a multivariate analysis combining ability scores with family background and other neighborhood factors, ability scores accounted for the largest share of explained variance in school achievement in both 1960 and 1970. In 1970, social class and race both added significantly to the explained variance in school achievement after ability scores. In 1960, only social class added to the explained variance.

This research has shown social class to be a powerful predictor of school achievement along with other socioeconomic measures and ability scores. Additional research on issues raised by this study will be required in other cities. Also,

this research should be replicated when 1980 data are available.

This abstract of 568 words is approved as to form and content.

Daniel U. Levine

Daniel U. Levine, Ph.D.

The undersigned, appointed by the Dean of the School of Graduate Studies, have examined a dissertation entitled "The Relationship of Social Class to School Achievement in Kansas City, Missouri, 1950-1970," presented by Bruce Blake Morgan, candidate for the Doctor of Philosophy, and hereby certify that in their opinion it is worthy of acceptance.

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CHAPTER I

INTRODUCTION

> Schools bring little influence to bear on a child's achievement that is independent of his family background and general social context. . . . [this] means that the inequalities imposed on children by their home, neighborhood, and peer environment are carried along to become the inequalities with which they confront adult life at the end of school. (Coleman et al., 1966, p. 325)

Background

This research is an ecological study of the relationship of social class to school achievement in Kansas City, Missouri. Specifically, the research addresses the relationship of alternative social class measures (based on occupation) for elementary attendance areas in Kansas City with the school median achievement on standardized tests of sixth graders. A correlation analysis is conducted between alternative social class measures and other socioeconomic measures as predictors and school achievement as the criterion or dependent variable. School achievement scores between 1957-1976 are explained or predicted through analysis of predictor variables for 1950, 1960 and 1970. Also, the research explores the methodological issue of time-lagged predictor variables and the effects of dynamics of neighborhood change.

This study can be described under the rubric of educational production function studies (Hanushek, 1979, p. 354). Hanushek (1979) defined educational production function studies as statistical analyses relating student outcome (e.g., school achievement) to characteristics of the students, their families, other students in the school, and characteristics of schools. Hanushek (1970, pp. 80-82) identified the educational production function as follows:

$$A_{it} = f(B_i^{(t)}, P_i^{(t)}, S_i^{(t)}, I_i)$$

where, for the ith student, A_{it} = achievement at time t is a function of $B_i^{(t)}$, the family background influences cumulative to time t; $P_i^{(t)}$, influences of peers cumulative to time t; $S_i^{(t)}$, school inputs cumulative to time t; and $I_i^{(t)}$, the innate abilities of the student. The primary focus of this research is concerned with more explicitly defining what measures should be included in the family background vector, $B_i^{(t)}$, the relationship of alternative measures to school achievement, the effects of time lag on the relationship, and the stability of the prediction of school achievement by alternative measures over time.

Social class, the major family background variable under consideration in this study, has been shown to be related to school achievement (Havighurst & Levine, 1979). The relationship of alternative social class measures to school achievement, effects of time-lagged variables, and stability

over time of predictive models relating various family background measures to school achievement have not been fully explored.

Havighurst and Levine (1979, p. 22) discussed social class as primarily related to a person's occupation and education. Clark (1972, p. 410) noted that the role of education has shifted in recent decades. Clark believes this has occurred because social and economic success is dependent upon the individual gaining a position in a large-scale bureaucracy. Since these positions are often based on education and training, a person's education becomes a crucial determinant of one's occupation and social class.

Other research has identified the importance of other socioeconomic measures as important family background variables related to school achievement. Coleman et al. (1966) found that race accounted for variation in school achievement. Levine et al. (1979), Kukuk et al. (1978), Meyer and Levine (1978), and Meyer (1974) have found income, education, race, density and neighborhood type important in explaining variances in school achievement. These studies have not fully explored the effects of neighborhood change, stability of the predictive models, or alternative social class measures based on occupation. This research will be concerned with these issues and more fully discuss the conceptual base and research framework in chapters II and III.

Significance

This research is important to school administration in helping to understand the correlates of school achievement. School administrators, in conjunction with school boards, teachers and patrons, allocate staff, materials and facilities on the basis of their understanding of factors affecting achievement. Better allocation decisions could be made and use of limited resources optimized if our understanding of the major external influences and their relationships to school achievement were better known.

External influences may not be directly controllable by school administrators. However, they need to know as much as possible about external influences in order to isolate and analyze the effects of controllable factors. In addition, an understanding of the relationship between external influences and school achievement could result in the marshalling of community resources to address these external influences, thus alleviating impediments to the school's ability to successfully socialize the young. Also, greater understanding of external influences related to school achievement could result in development of policies designed to accomplish renewal of the city.

This research is also important to the sociology of education by helping to define what measures should be used to describe family background and its relationship to achievement. The research will illustrate how the choice of measures

can affect the results of the analysis. In addition, this research will address the methodological problems of the dynamics of neighborhood change and how these dynamics affect the explanation of school achievement in big-city schools. The research uses an urban ecological approach and draws heavily from the tradition of this approach to understanding the city.

Approach

The general approach used in this research is a correlation analysis of alternative social class measures and other important socioeconomic variables with school achievement. The dependent variable, school achievement, is represented by the school medians on standardized achievement tests for sixth-grade reading comprehension by elementary attendance areas in Kansas City, Missouri, for 1957-1976. This time period is used because of data availability and because Kansas City generally operated under a neighborhood school plan until 1977 in which students attended the elementary school closest to where they lived. The unit of analysis is thus the elementary attendance area.

Alternative social class measures and other socioeconomic variables (e.g., race, education, income, density and housing value) are the major predictors or independent variables which represent family background or neighborhood characteristics. These predictor values are obtained from

census tract data for 1950, 1960, and 1970 and tract data are aggregated into elementary atterdance areas. An ability score for each elementary attendance area is also obtained for selected years 1957-1976 to compare its relationship to school achievement in contrast to the family background variables.

Correlation analysis is used to examine the bivariate relationships between major predictor variables for 1950, 1960, and 1970 with sixth-grade school achievement for 1957-1976. Scatter plots are used to interpret nonlinear relationships. Variables that are nonlinear are transformed in logarithmic and quadratic polynomial form to test the strength of the relationship.

Multiple regression analysis is used to explore the effects of time-lagged variables, change variables, and stability of multivariate models for 1960 and 1970. Alternative time lags between major predictor variables and school achievement are studied. Changes are calculated for predictor variables and the relationship tested between changes in the dependent variable from 1957-1976 and the dependent variable unchanged. A multivariate model predicting school achievement in 1970 and 1960 is developed from the predictor variables using stepwise multiple regression analysis.

Limitations

The research is primarily limited by the data and analytical methods. The data used on school achievement are school medians for each elementary school attendance area.

These data were obtained from school profiles developed by the Kansas City School District. These data potentially have measurement and scoring errors, do not accurately measure the real achievement of all students in the elementary attendance area, and may not accurately reflect the output of schooling. However, standardized achievement tests scores are widely used and accepted by educators, policymakers, and parents.

Census data used in this study also have limitations. Census data are time and place bound, have measurement errors, often are only indirect measures of the variables they represent, are based on varying samples, and have slight changes in definition over time. Census data are widely used in education research and the only aggregate data available over several time periods. Census data are also used extensively in urban ecological research.

The analytical methods used in this research are able to examine the strength, magnitude, and degree of relationship between the predictor and criterion variables. However, correlation does not mean causation. In chapter IV, additional cautions and special problems in the analytical methods used are further explained. Since this research deals with aggregate data, inferences will only be made regarding the aggregates. Inferences will not be made about individual students. Analysis of aggregate data does serve as a useful framework for educational production function studies and will be used in this research.

Organization of Dissertation

This dissertation includes eight chapters in addition to the introduction. Chapter II contains a review of literature to provide a conceptual base derived from previous research in urban ecology, social class and education studies. Chapter III outlines the dissertation's research framework, design and methodology. Chapter IV discusses the analytical procedures used in the research. The results of the analyses of the relationship between social class, socioeconomic measures, student ability, and school achievement are reported in chapters V-VII. Chapter VIII discusses the results and findings regarding the hypotheses studied, other educational research, and research on big-city schools. Chapter IX contains conclusions and presents implications of this research.

CHAPTER II

REVIEW OF LITERATURE

This study was described in the last chapter as an ecological study of the relationship of social class to school achievement in Kansas City, Missouri. The major predictor variable considered in this research (except ability scores) are related to family background or neighborhood characteristics as inputs into the education system and the dependent variable, school achievement, is often identified as a major output of the education system. As was noted earlier, analyses of this type are called educational production function studies. The conceptual base for these studies and the present study draws from education, sociology, geography and economics literature. This chapter will discuss these conceptual antecedents from the point of view of urban ecology, social class research, and educational production function studies. The discussion is organized to move from the general conceptual level to specific educational research of relevance to the present effort.

Urban Ecology

Definition

Robert Park (1929, p. 19) described a city as a particularly advantageous place to study major institutions such

as education because the city as a social laboratory allows the observation of the processes of growth, development and change. Park and his colleagues at the University of Chicago studied many facets of social life in the city during the 1920s and 1930s. The major approach to these studies became known as urban ecology. The definition of urban ecology, the scope, and major principles of the approach were written by R. D. McKenzie, one of Park's students and later a colleague. McKenzie (1924, p. 288) defined urban ecology as the study of the "spatial and temporal relations" of persons to their environment. A city was viewed as an ecological distribution of people and services in which the spatial location of each unit was determined by its relation to all other units (McKenzie, 1926, p. 143). Aggregate data were obtained for "ecological units" or small areas within the city to study various social phenomena such as crime, education, mental health, housing, and the processes of city growth, development and change (Thomlinson, 1969, p. 10).

Meyer (1974, p. 170) demonstrated that ecological analysis was a useful approach in accounting for differential achievement levels among schools. However, Herbert (1976, p. 123), in a major review of urban education research in Britain and the United States, found a lack of a strong research tradition in urban ecological studies. This present research will draw upon several of the concepts used in urban

ecology and add to the urban ecological tradition a study with an education perspective.

Concept of Neighborhood or Natural Area

Urban ecology divides the city into a set of subareas for analysis as aggregates. Park (1929, p. 9) describes the city as a constellation of these subareas or natural areas each with its own characteristics. Greer (1968, p. 122) described natural areas within the city as "residential enclaves," with distinct characteristics, physical boundaries, and homogeneity by social class. The natural area became the unit of analysis in urban ecological studies (McKenzie, 1926, p. 143).

Closely related to the natural area and used synonymously in much urban ecological research, is the concept of neighborhood. In the classic study of neighborhood life in the city of Columbus, Ohio, McKenzie (1921, p. 345) noted that neighborhood has two connotations--physical proximity to an area and intimacy of association among people. McKenzie (1921, p. 352) used the neighborhood as an ecological unit of analysis because it represents a "patch of common life" within a city sufficiently differentiated from the city as a whole to be thought of as a unit.

Keller (1968, p. 87) defined neighborhood as a distinctive area within a city with both physical and social components. Neighborhoods were identified as distinctive in

terms of geographic boundaries, characteristics of residents, sociological unity among people who feel they belong together, or the concentrated use of an area's facilities for shopping, leisure, or learning. Warren (1977) also described the neighborhood as the social organization of a population residing in a geographic proximate locale.

Urban ecological studies have used aggregate data for analyses. The census tract has been a convenient unit to gather data for additional analysis or aggregation into neighborhoods (Thomlinson, 1969, p. 23). Census tracts were established as small areas within cities, of generally uniform size, with regard to natural geographic features, and usually remaining unchanged between decades (Coulter & Guralnick, 1959, p. 731). Greer (1968, p. 122) described census tracts as the basic unit to collect data on urban neighborhoods because tracts are small and allow comparisons over time. Coulter et al. (1959, p. 732) found the census tract a useful unit for data analysis because of the widespread use of tract data by agencies and reporting of agency data by tracts. In this study, census tracts will form the basic unit to collect data aggregated into larger areas or neighborhoods.

Delineation of Neighborhoods in Kansas City

Park and Burgess (1925, p. 7) identified the neighborhood as the smallest unit in the social and political organization of the city. This study will use elementary

attendance areas in Kansas City as the aggregate unit of analysis to represent approximate neighborhoods. This unit of analysis is consistent with urban ecological research and has a practical basis in Kansas City.

The City Plan Commission of Kansas City, working with the Board of Education and Kansas City Parks and Recreation Department, developed a master plan in 1948 for neighborhoods, schools and recreation. This study delineated sixty-eight neighborhoods in Kansas City which coincided with elementary attendance areas (1948, p. 5). The elementary school was identified as the dominant cohesive element in identifying the boundaries of Kansas City to guide the location of new schools, relocations and closures over the next two decades (1948, p. 16). The elementary attendance area boundaries were in place with minor shifts or changes until 1977 with the implementation of a court-ordered desegregation plan.

Dynamics of Neighborhood Change

A major confounding problem in urban ecological research is how to deal with the dynamics of neighborhood change. This study will specifically address the dynamics of neighborhood change related to school achievement in Kansas City between 1950-1970. Kansas City, like many other cities, does not remain static but is constantly evolving and changing.

McKenzie (1924, p. 292) described the development of a city as a series of cyclic processes of change. The effects

of change give a city well-defined areas, each with its own characteristics. The processes of invasion, succession and segregation of areas within the city were defined as ecological processes by McKenzie (1924, p. 300). Guest (1974, p. 28) found that neighborhoods follow a series of life cycle stages generally marked by progressive declines in social class. Social class is a major predictor variable in this research and the dynamics of neighborhood change in Kansas City will be one of the issues analyzed.

Social Class

Definition

Havighurst and Levine (1979) pointed out the importance of social class in explaining variances in school achievement in big city schools. They defined a social class group as "people who have similar attitudes, habits, and values" and who are organized into a hierarchical structure (1979, pp. 16-17). Gist and Fava (1974, pp. 329-333) adopted a traditional Weberian perspective by describing social class as based on prestige, economic differentials, and power. In the early 1950s, one of the major studies on social class in a large city was conducted in Kansas City. Coleman and Neugarten (Gist et al., 1974) conducted extensive interviews in Kansas City and identified five major social classes based on several variables including income, education, and prestige.

Vanneman (1977, p. 783) pointed out that much recent research on social class has abandoned the bounded-class models (Weberian perspective of discrete categories) in favor of quantitative, empirical research using continuous scales. The alternative social class measures used in this study contain both bounded-class model and continuous scale perspectives.

Measuring Social Class

Hodges (1964, p. 78) identified four major approaches to measuring social class: study of lifestyles, prestige, class consciousness, or occupation. Adopting a structural-functional view, Hodges (1964, p. 89) believes occupation outweighs the others as a single criterion of social class, and, in this view, stated that social class is based on differences in wealth and income which are derived from a person's occupation; however, he cautioned that no single criterion is foolproof.

The U.S. Census of Population groups the labor force into occupational categories based on an adaptation of socioeconomic groupings originally developed by Alba Edwards in 1940. Edwards (1943, p. 176) designed occupational groupings around qualifications, work performed, status, and to separate blue-collar and white-collar occupations. Edwards was striving for a scale to measure socioeconomic status that would allow comparisons over time of relatively homogeneous groupings.

Miller (1977, pp. 211-212) pointed out that occupation has been shown to be the best single predictor of social class. Miller further believes the Edwards occupational groupings are an adequate broad classification.

Although the Bureau of the Census (1963, p. 1) has refined Edwards' occupational groupings, it has retained many of the original categories. The adaptation of Edwards' occupational groupings has been criticized for its lack of precision in terms of homogeneity and scale properties of the hierarchy, but no better basis to universally measure social class has been developed. The Census adaptation of Edwards' occupational groupings is widely used, readily available, and can be combined in additional groupings as needed. In urban ecological studies, the usual approach describes a general or average pattern for an aggregate area. Since a precise measure is not needed, a crude measure such as the Edwards' grouping is sufficient (U.S. Bureau of Census, 1963, p. 2).

Warner, Meeker and Eells (1960), Hollingshead and Redlich (1958), and Havighurst and Levine (1979) also used occupation as a key factor in measuring social class. Warner et al. (1960) and Hollingshead et al. (1958) base social class on multiple factors including residence, occupation, income, and education. Both methods use multiple regression analysis to derive weightings for the various factors, and occupation is weighted most. Havighurst et al. (1979, p. 313) have developed a socioeconomic ratio from census data which results

in a ratio of blue-collar (working class) to white-collar (middle class) occupations.

Alternative social class measures for this study will be based on an adaptation of Hodges (Goldsmith et al., 1975, p. 30), Edwards' groupings from the U.S. Census of Population, and the Havighurst et al. (1979, p. 313) socioeconomic ratio. Chapter III defines the specific measures in greater detail.

Educational Production Function Studies

Definition

Education can be described as a system (Herriott & Muse, 1973, p. 210). The inputs to education include teachers, materials, facilities, and students. The throughput or property acted on are the students' innate abilities. The outputs of the system are pupils' performance, most often measured by scores on standardized achievement tests. Since 1960, education effects studies which view the schools in an input-output framework have become common. Hanushek (1979, p. 351) believes considerable confusion exists on how to conduct, analyze, and interpret input-output studies into the educational production function outlined in chapter I.

Hanushek (1979, p. 352) identified the Coleman et al. (1960) study of Equality of Educational Opportunity as one of the first and most influential input-output analyses into the educational production function. The Coleman report was influential because of its size, attention to the relationship

between various inputs and school achievement, and introduction of statistics into the public policy area. The number of input-output studies since Coleman has been quite large, several with different and contradictory results. Hanushek (1979, p. 376) called for additional research, such as this study, into definition and measurement of specific variables to be included in each vector of the educational production function and the form of the functional relationship.

Previous educational production function studies (Hanushek, 1979, p. 377) have resulted in several general findings. Differences in family background have been found to lead to significant differences in achievement. Socioeconomic status measures have been used as proxies for family background. Schools are not economically efficient in the allocation and mix of resources in an optimum fashion. Differences in the educational production function occur by schools, by race, and family background.

One major conceptual difficulty in educational production function studies is the appropriateness of standardized achievement test scores as an appropriate measure of school output (Hanushek, 1979, p. 355). Critics point out the lack of external validity with societal values and the inadequacy of standardized achievement tests as a measure of the education received. Hanushek (1979, p. 359) favored use of standardized achievement test scores because they are commonly available, are widely used to evaluate programs and allocate

funds, are valued by parents and decisionmakers, and are used widely by educators. Farr (1969, p. 13) cited evidence that standardized achievement test performance and socioeconomic status are highly related at all levels from first grade through college. Chall (1970, p. 51) cautioned that achievement tests only sample behavior and measure what a person does at a particular time and place, so are only relatively indicators.

Herbert (1976, p. 125) noted that a major dichotomy in educational production function research is what variables are related to achievement--innate abilities (e.g., intelligence) or derived abilities from an environmental context (e.g., family, neighborhood, and peers). Sociologists are primarily concerned with studies of environmental contexts. This study will focus on family background and neighborhood factors but will include an ability measure for comparison purposes.

Neighborhood and Family Background Predictors

Levine et al. (1979), after several years research in seven big-city school districts, found lower socioeconomic status to be systematically related to lower school achievement. In Kansas City, school achievement measured by standardized tests of reading comprehension for elementary schools was highly predictable based on neighborhood characteristics such as density and education. The best predictors were

selected exclusive of race and ethnicity and found to be stable from year to year. Levine et al. (1979, p. 2) also found definite threshold points on selected measures of urban social structure beyond which school achievement tended to be uniformly low. The Levine et al. research was primarily conducted in the early 1970s without a direct measure of social class. This study will build on these findings and also explore additional issues related to time-lagged variables and dynamics of neighborhood change.

Kukuk, Levine and Meyer (1978) found race and income to be highly related to each other. However, race and income had few direct effects on school achievement in a study of six big-city school districts. In a path analysis, neighborhood level measures of family structure and density appeared to transmit some of the effects of minority status and income level on achievement. Meyer and Levine (1978) also found density and housing value related to school achievement. A density threshold seemed to be consistently associated with low achievement. Meyer's (1974, p. 171) dissertation previously showed that relationships between school achievement and other socioeconomic measures were distinctive by neighborhood. These findings have been consistent with earlier studies but have refined specific variables and measures to be included in educational production function studies.

Jencks et al. (1972) found family background and income each related to school achievement independent of

individual abilities. Auer et al. (1978, pp. 5-7) in a study of 435 elementary schools in California found education and income as strong predictors of school achievement. Ethnicity was found to be the most potent predictor variable, but Auer et al. could not sort out effects of income and education.

Mayeske et al. (1969, p. xiv), in a major reanalysis of the Coleman data, found considerable interaction between family background variables and school inputs in explaining variances in achievement between schools. School inputs were found to be important, but their influence on school achievement was bound up with the student's family background. The socioeconomic status or social class measure used to indicate family background was the parent's occupation (1969, p. 107). Schools with a high socioeconomic status tended to have higher achievement levels.

Touliatos, Lindholm and Rich (1978, p. 23) studied the influence of family background variables on school achievement and found children from higher social classes did better in achievement than children from lower social classes. The highest social class grouping showed a more persistent trend toward improved prediction as grade level increased in comparison to lower social class groups (1978, p. 26). The Touliatos et al. study divided families into social class groups based on the occupation of the head of the household. An earlier study by Touliatos et al. (1977, p. 363) of the same data found interaction between race and social class as predictors

of school achievement.

While several of these studies have found several family background variables important in explaining variances in school achievement, there have been criticisms. Miller (1970, p. 268) was critical of social class as a family background variable because in his opinion it was only a crude variable and of limited direct importance in explaining school achievement. Spady (1973, p. 138) also was critical of educational production function studies for using crude measures of nonschool environments, lacking measures of previous achievement, and not including a variable on student's ability.

Neighborhood and family background variables have been shown to be important predictors of school achievement. Most of the studies cited have been cross-sectional and have not fully explored the use of time-lagged variables or the dynamics of neighborhood change. The educational production function studies have not used a consistent measure of social class based on occupation or fully explored the implications of alternative social class measures. Chapter III will present the framework, design and methodology to tie this conceptual base into how this research will address issues raised by previous educational production function studies.

CHAPTER III

RESEARCH FRAMEWORK, DESIGN, AND METHODOLOGY

Hypotheses

The hypotheses investigated in this study include:

H_1--Alternative social class measures will yield similar results as predictors of school achievement.

H_2--Social class measures and other socioeconomic variables (race, education, income, density, and housing value) considered to be important in previous research will be statistically significant predictors of school achievement over three time periods (e.g. 1950, 1960, 1970).

H_3--Lagging of predictor variables such as social class and other socioeconomic measures will improve or strengthen their relationship with school achievement.

Rationale for Hypotheses

In chapter II, the importance of social class in explaining variances in school achievement was noted. The previous research has not fully addressed whether alternative social class measures will yield similar results as predictors of school achievement. Occupation was found to be a key component in defining social class (Hollingshead et al., 1958; Warner et al., 1960; Havighurst et al., 1979; and Miller,

1979). The first hypothesis proposes to address whether alternative social class measures based on occupation will yield similar results as predictors of school achievement. Hanushek (1949, p. 364) pointed out that many educational production function studies use multiple regression analysis as a major analytical technique. The choice of measures as well as omission of important variables can seriously bias the estimated regression coefficients and affect the interpretation of results. Data are readily available to test the U.S. Bureau of Census (1963) adaptation of Edwards' socioeconomic groupings, Havighurst et al. (1979) socioeconomic ratio, and the National Institute of Mental Health's adaptation of Hodge's status groupings (Goldsmith et al., 1975). A greater understanding of the relationships of these alternative social class measures to achievement could result in improvements in educational production function studies.

One of the key empirical issues not fully explored in educational production function studies concerns the stability of predictive relationships over time (Hanushek, 1979, p. 364). Most educational production function studies use only current data and little attention is devoted to the dynamic nature of education systems. This study will explore the question of whether social class and other socioeconomic measures are statistically significant predictors of school achievement over three time periods (1950, 1960, and 1970). The understanding of stability of predictors of school achievement

over three time periods may contribute to better prediction of school achievement and assessment of the impacts of alternative policies.

Hypothesis three on lagging of predictive variables to determine whether a time lag improves or strengthens the relationship with school achievement is also an important methodological issue for educational production function studies. Closely related to time-lagged variables is the issue of how the dynamics of change between one time period and another affects the strength of the predictive relationship. Although much has been written about the relationship between social class and other socioeconomic measures as predictors of school achievement, little educational research has addressed time-lagged variables.

Educational production function studies draw much from economics for a conceptual base. Goldberger (1963, p. 274) noted that it is common in economics to find a dependent variable (e.g., school achievement) responding to an exploratory or predictive variable with a delay. This delay is referred to as a lag. To lag means that one variable will follow a change in another variable by a regular interval.

Blalock (1964, pp. 55-56) suggested using time-lagged variables to assess the adequacy of a causal or predictive model. Campbell and Stanley (1963, p. 65) described time-lagged variables as useful to establish temporal antecedents and infer a direction of causality by examining the relative

magnitude of correlations between two variables at different points in time. Examples of time-lagged variables in educational production function studies are not common, though Hanushek (1979, p. 364) suggested using them. Campbell and Stanley (1963, p. 69) pointed out that time-lagged variables should result in higher correlations if theoretically sound and if the predictor variables are related to the dependent variable as a prior "cause."

An important distinction in this study is that the predictor variables to be lagged are assumed in hypotheses one and two to be related to school achievement. Heise (1975, p. 184) cautioned against the routine use of lagged variables when the lagged variables may not be theoretically related. The predictor variables in this study are believed to be related to school achievement and consistent with educational production function studies.

Study Design and Methodology

Population

The unit of analysis is the elementary school and its surrounding attendance area, which is assumed to be a close approximation to neighborhood. During the time period between 1957-1976, the Kansas City School District reported median school achievement scores for between sixty-four and seventy-nine schools. The closure, addition, or failure to report scores for schools still open accounted for the shifts

in number. This study uses the entire population of elementary schools available in a given year.

Time Period

The time period for the study will be each year between 1957-1976 for school achievement data and 1950, 1960 and 1970 for major predictor variables. The 1957-1976 time period for achievement data was chosen because the earliest data reported on a districtwide basis for elementary schools were for 1957. It has already been stated that Kansas City generally operated under a neighborhood school plan until 1977 when a school desegregation plan was implemented which moved students from one attendance area to another.

The major predictor variables, except ability scores, coincide with the 1950, 1960 and 1970 U.S. Census of Population and Housing. Ability scores were obtained for selected years to follow school achievement scores. The twenty-year time period chosen for analysis allows for sufficient data to test the hypotheses under consideration and the sub-issues that are likely to arise.

Sources of Data

The major data source for school achievement scores and ability scores was the Kansas City School District. Access to school profiles prepared on each elementary school was granted in order to obtain school medians for both achievement and ability scores. School achievement for an

elementary school was represented by the school median, expressed in grade equivalents, on the Stanford Achievement Test (1957-1963) and the Iowa Tests of Basic Skills (1964-1976). Data were obtained for each school for grade six reading comprehension.

The time of testing, form used, and any unusual notes related to test results were obtained for each year. School medians were found to be significantly higher between 1973-1975 due to out-of-level testing which resulted in a smaller sample for grade level and skewed results upward. Also, testing was done later in the year in 1975, which artificially boosted test scores for one year. Data for these three years could not be used for further analysis because they were not comparable to the 1957-1972 results or the 1976 results.

An ability measure was obtained for each elementary school and was represented as the school median on standardized tests of mental ability. Kansas City used the Otis Quick Scoring Tests of Mental Ability (1957-1963), the Lorge-Thorndike Intelligence Test (1964-1973), and the Cognitive Abilities Test (1974-1976) during the period. An intelligence quotient of IQ score was obtained for each elementary school for selected years between 1957-1973 for grade five depending on data availability. Grade five ability scores from one year were used as a predictor of the next year's achievement scores. This procedure was necessary because ability scores were not reported for every grade level and only

selected years were available due to funding for testing activities in various years.

The other major predictor variables were obtained from the 1950, 1960 and 1970 U.S. Census of Population and Housing. Census data were obtained for census tracts and aggregated into elementary attendance areas following a procedure developed by Levine et al. (1979). Census tracts were used because the data were readily available, were generally designed to be uniform with respect to population and economic characteristics, and allowed comparisons over time (U.S. Bureau of Census, 1972, p. App 1). Census tracts in Kansas City could easily be combined into elementary attendance areas.

Data Preparation, Editing, and Data Base Development

Data from the Kansas City School District (school achievement and ability scores) required about three months to obtain and prepare for analysis. A proposal was written to a research committee, several meetings were held with district personnel, and a lengthy review was required to obtain access to the data. A coding form was prepared and data coded from elementary school profiles on each school. Additional research was necessary to ascertain school openings, closings, consolidations, and name changes during the 1957-1976 period. Also, data from the school profiles on the time of testing, form of test, and other unusual factors (e.g. out-of-level testing) were noted. Data were keypunched,

verified and visually checked for accuracy to reduce coding errors.

Census tract data for 1950, 1960 and 1970 required extensive preparation prior to merging into a data base with school achievement and ability scores by elementary attendance area. Levine et al. (1979) had eliminated some elementary schools from their analyses due to small enrollment. These schools were included in this research and required identification of census tracts with attendance area boundaries. Twenty-seven measures at the census tract level were selected for 1950, 1960 and 1970. Only five of these were available from printed census reports without additional computation. The remaining twenty-two were calculated first by census tract and then aggregated into elementary attendance areas. These separate data bases were prepared by census tracts for education, housing, and occupational data. Census tracts in Kansas City within the Kansas City School District ranged from 96 in 1950 to 136 in 1970. The greater number in 1970 was due to split tracts and expansion of the school district in the 1950s into the northeast area near Independence.

Computer programs were written using the Statistical Package for the Social Sciences (Nie et al., 1975). Coding sheets were written, keypunched, verified, and visually checked prior to computation. Once all variables and measures were computed, a data base for elementary attendance areas was prepared merging school achievement and ability

scores with census data. Five months of data preparation were required to develop the elementary attendance area data base used in this study.

Variables and Operational Measures

The criterion or dependent variable in this study was school achievement. The specific measure of school achievement was the school median, expressed in grade equivalents, for each elementary school on the standardized achievement tests discussed in the last section. Hanushek (1979, p. 354) noted that standardized achievement test scores were usually used to represent outputs in educational production function studies. Anderson and Faust (1973, pp. 104-106) discussed the limitations of standardized achievement tests as measures of achievement but believe the tests can assess general educational development in basic skills, diagnose strengths and weaknesses in common content areas, and can evaluate pupil progress of a general nature. By using the aggregate score for the elementary school, specific measurement is not essential. In urban ecological research, the primary concern is the patterns or spatial distribution of more general phenomena. At the aggregate level of analysis, school medians are an acceptable measure.

The same general discussion applies to using ability scores as a predictor variable. The school median ability score was used as the specific measure obtained from tests

discussed above for selected years. Anderson and Faust (1973, p. 106) place tests of scholastic aptitudes, such as the ability scores used in this study, on a continuum with standardized achievement tests. The continuum differs only to the degree of specific academic attainments measured. Anderson et al. (1973, p. 106) believe ability tests are a relatively good predictor for future academic success so the correlation with achievement test scores should be high.

Table 1 summarizes the major independent or predictor variables used in this study and obtained from the U.S. Bureau of the Census. Each of these major variables (e.g., social class, race, education, income, density, and housing value) included alternative measures. Data were obtained at the tract level for each measure and aggregated into elementary attendance areas. All measures are expressed as interval level variables.

As shown in table 1, social class is represented by three alternative sets of measures based on occupation. An adaptation of Alba Edwards' socioeconomic grouping of occupations is used by the Census to divide occupations into eight groupings. Havighurst and Levine (1979) divided occupations into white collar or middle class and blue collar or working class. Havighurst's socioeconomic ratio is then computed by weighting the components.

TABLE 1

MAJOR INDEPENDENT VARIABLES AND DEFINITION OF MEASURES

Abbreviation	Definition of Measure
	Social class
1. Adaptation of Alba Edwards' Socioeconomic Grouping of Occupations (1943)	
PCPROF	Percent professional, technical and kindred workers[a]
PCMGR	Percent managers and administrators
PCSALE	Percent sales workers
PCCLER	Percent clerical and kindred workers
PCCRAF	Percent craftsmen, foremen, and kindred workers
PCOPER	Percent operative, including transport equipment
PCLAB	Percent laborers
PCSERV	Percent service workers
2. Havighurst's Socioeconomic Ratio (1979) and Components	
SER	A ratio of white-collar or middle-class occupations to blue-collar or working-class occupations. Uses data from census. Computed as (2UM + LM)/(UM + 2LW).
PCUM	Percent upper middle class (professional, technical and managerial)[a]
PCLM	Percent lower middle class (clerical and sales workers)
PCUW	Percent upper working class (craftsmen, foremen, and operatives)
PCLW	Percent lower working class (laborers and service workers)

TABLE 1--Continued

Abbreviation	Definition of Measure
3. NIMH Adaptation of Hodge's Social Status Indicator (1975)	
PCHST	Percent high status (professional, technical and managerial)[a]
PCMST	Percent middle status (clerical, sales, craftsmen and foremen)
PCLST	Percent low status (operatives, laborers, and service workers)
Other selected socioeconomic measures[b]	
1. Race	
PCBLK	Percent of total population black
PCBRHU	Percent black renter occupied housing units
2. Education	
PCPSE	Percent persons, 5-19 years old, enrolled in public school
PCHSG	Percent persons, 25 years old and over, who were high school graduates
MDEDUC	Median school years completed, persons 25 years old and over
3. Income	
MDINC	Median income of all families
4. Density	
PCHUV	Percent year-round housing units vacant
SIXPL	Percent occupied housing units with six or more persons
PROOM	Percent occupied housing units with greater than 1.01 persons per room

TABLE 1--Continued

Abbreviation	Definition of Measure
5. Housing Value	
MDVOHU	Median value of owner-occupied housing units
MDVRHU	Median contract rent of renter-occupied housing units

[a]Occupation data obtained from Census of Population for 1950, 1960, and 1970. Occupations are reported for males, 16 years old and over in 1970, and for males, 14 years old and over in 1960 and 1950.

[b]Selected socioeconomic measures obtained from Census of Population and Housing for 1950, 1960, and 1970.

For this study, the percent of persons in occupations in each component (e.g. upper middle class) was calculated and added to the analysis for comparison with the other measures of social class. The National Institute of Mental Health (Goldsmith, 1975) adapted Hodge's social status groups into low, middle, and high status. All social class measures are expressed as percents except the socioeconomic ratio.

Other selected socioeconomic measures were used based on previous research to operationalize race, education, income, density, and housing value. Race, education and income were general family background variables; density and housing value represented neighborhood variables. Race had two

measures: the percent of total population who were black and the percent of black renter-occupied housing units. Education was represented by the percent of persons age five to nineteen years enrolled in public school, the percent persons twenty-five years old and over who were high school graduates, and the median school years completed by persons twenty-five years old and over. The measure for income was the median income of all families.

Housing-related or neighborhood variables included density and housing value. Three measures were used to indicate density: the percent year-round housing units vacant, the percent occupied housing units with six or more persons, and the percent occupied housing units with greater than 1.01 persons per room. Housing value included the median value of owner-occupied housing units and the median contract rent of renter-occupied housing units.

Minor definitional changes were made in some measures (e.g., occupations included and for what age reported). However, in an aggregate level of analysis such as this study these variations are assumed to be minor and do not significantly alter the general trends discussed later in the dissertation. All measures were based on a 100 percent enumeration except the education, income and occupation measures which were based on a 20 percent enumeration sample (U.S. Bureau of Census, 1972, p. App 14). At the aggregate level used in this study potential measurement errors should be

minimized for the measures which are based on a sample. However, examination of unusual cases (elementary school attendance areas) in scatter plots will be studied later to identify high outliers and the reason for the distribution.

Chapter IV will describe how these variables were transformed into logarithmic and quadratic polynomial form to test curvilinearity. Also, computation of change variables and various time lags will be explained.

Expected Results

The three hypotheses discussed earlier in this chapter are expected to be supported by the results of this research.

Alternative social class measures are expected to be correlated with grade six school achievement. Other socioeconomic measures are also expected to be correlated with school achievement. Previous research has found some of the variables (e.g., race and density) to have higher correlations in a curvilinear form. Transformations of variables with curvilinear relationships should be expected to increase the resulting correlation coefficients and be statistically significant.

Time-lagged variables and change variables are expected to increase correlation coefficients as predictor variables are lagged. For example, sixth graders are predominantly twelve years old. If the percent of high status

persons in 1970 is positively correlated with school achievement in 1970, the correlation should be higher by lagging percent high status (e.g., use 1960 percent high status to predict 1970 school achievement). If the analysis produces the results expected, the "best" lag can be determined not only for social class but also for other socioeconomic measures.

If the results related to time-lagged variables are not confirmed, one possible explanation might involve the dynamics of neighborhood change and the relationship between those dynamics and school achievement. This research will explore change variables to determine if change variables are better predictors and the resulting correlations are higher. It may be possible to statistically control for certain variables (e.g., 1960 achievement can be controlled for in a multivariate model predicting 1970 achievement) to better understand the dynamics of change.

This research will also consider an ability measure as a predictor variable to illustrate its relationship to school achievement in comparison to family background and neighborhood factors. Ability scores are expected to be highly correlated with school achievement consistent with findings of Otis (1954) and Lorge, Thorndike and Hagen (1964). When the best predictors based on family background and other socioeconomic measures are considered with ability scores, the resulting model should account for a large explained

variance in school achievement.

The work of Levine et al. (1979) should be supported if statistically significant predictors are stable over the three time periods (1950, 1960, and 1970). The addition of the best social class measure, time-lagged variables, and consideration of the dynamics of change should result in improvements to the Levine et al. (1979) research on school achievement in big cities. Improvement will be judged by how the variables added from this research change the coefficient of determination or explained variance in line with theoretical relationships, without adding too much redundancy, and the addition being statistically significant.

Chapter VI describes the analytical procedure required to obtain these expected results and test the hypotheses to be investigated.

CHAPTER IV

ANALYTICAL PROCEDURES

This study is concerned with the relationship between an interval scale dependent variable (school achievement) and a set of interval and ratio scale predictive or independent variables (social class, race, education, income, density, and housing value). Blalock (1979, pp. 18-19) defines an interval scale variable as having a "physical unit of measurement which has a common standard" and a ratio scale as an "enumeration that is standardized by some population base." School achievement measured in grade equivalents or ability scores expressed as intelligence quotients are examples of interval scales. The percentage of total population black or percentage persons in low status occupations are examples of ratio scales. Interval scales do not have an inherently determined zero point but the zero point in a ratio scale is defined by the measurement scheme (Nie et al., 1975, p. 5).

When the dependent variable is measured as an interval scale and the measurement level of a second variable is also an interval or ratio scale, the analytical procedures are usually correlation and regression (Blalock, 1979, p. 381). Correlation analysis is used to study the relationship between two variables and regression analysis is used to

predict the value of one variable from another. The major analytical procedures used in this study will be correlation and regression analysis of the relationship between predictor variables and the dependent or criterion variable. This chapter will outline the procedures used in this research.

Correlation Analysis

Definition

A correlation is a relation between two variables (Kerlinger & Pedhazer, 1973, p. 11). Bivariate correlation analysis provides a single number which summarizes the relationship between two variables (Nie et al., 1975, p. 276). This number, the correlation coefficient, indicates the degree to which variation (or change) in one variable is related to variation (change) in another.

Several assumptions are present in correlation analysis. Loether and McTavish (1974, p. 308) list the key assumptions as follows: the independent variable is related in a linear fashion to the dependent variable, all variables are interval or ratio scale, and the variance in the dependent variable is equal across all categories of the independent variable. Mueller et al. (1977, p. 248) refer to equal or uniform distribution of variances as homoscedasticity. If the variances are not uniform between two variables, the unequal distribution is referred to as heteroscedasticity. Nonlinear relationship between two variables have a

heteroscedastic pattern and require transformation to obtain the highest correlation.

Interpretation

Correlations reveal a mathematical relationship of how two variables are related but do not mean causation (Mueller et al., 1977, p. 268). Correlation coefficients are sensitive to extreme values (Loether et al., 1974, p. 260). Also, two variables may be related but not in a linear fashion so Loether et al. recommend checking for curvilinearity.

Mueller et al. (1977, pp. 268-272) offer several cautions in interpretation of apparent correlations between two variables. Correlations may be high due to spurious correlation, built-in correlations, or association due to chance. Related to this research is the issue of ecological correlation. Ecological correlation means that correlations between variables involving aggregates cannot be used to make inferences about individuals (Loether et al., 1977, p. 259).

Nonlinear Relationships

Often in social science research two variables will not be related in a linear fashion. Curvilinear relationships can be examined by a scatter plot of the two variables. A scatter plot or diagram is useful to determine whether the relationship between two variables is linear or curvilinear, positive or negative, weak or strong, and homoscedastic or

heteroscedastic (Mueller et al., 1977, p. 249).

Variables can be transformed when a curvilinear relationship is present. The logarithmic transformation is most often used (Nie et al., 1975, p. 369). Polynomials raised to various powers (square, cube, etc.) are also used to test curvilinearity. A curvilinear relationship is usually tested with bivariate regression analysis. The purpose of regression analysis is to "fit" a curve to the relationship between two variables. The correlation coefficient in bivariate regression indicates the "goodness of fit" of data on the regression line (Nie et al., 1975, p. 279). Blalock (1979, p. 425) proposes a statistical significance test to determine whether the linear variable is more highly related to the dependent variable than the nonlinear variable.

Bivariate regression analysis and correlation analysis are used to study the relationship between predictor variables and the dependent variable in this study for both linear and nonlinear relationships.

Multiple Regression Analysis

Definition

Multiple regression analysis is a general statistical technique to analyze the relationship between a dependent variable and two or more independent variables (Nie et al., 1975, p. 321). The same assumptions of simple correlation and bivariate regression analysis apply to multiple regression

analysis with two additions--the independent variables are not highly correlated and the effects of the independent variables can be added together to yield a prediction (Loether et al., 1974, p. 308).

Kerlinger et al. (1973, p. 5) point out several examples of the application of multiple regression analysis in educational production function studies. As independent variables are added to predictive equations, the contribution to the coefficient of determination or explained variance can be tested using the F test of statistical significance computed with the following formula (Kerlinger, 1973, p. 70):

$$F = \frac{(R^2_F - R^2_R)/(k_1 - k_2)}{(1 - R^2_F)/(N - k_1 - 1)}$$

where, R^2_F = the full regression model; R^2_R = the regression model minus the added variable; k_1 and k_2 = the number of variables entered in each model; and N = the number of cases.

This research will use multiple regression analysis to identify the best predictive models for 1960 and 1970 between social class, other socioeconomic measures, and school achievement. Also, the comparison of ability scores and family background and neighborhood factors will be made using multiple regression analysis.

Special Analytical Problems

Carver (1978, p. 383) presents a strong case against statistical significance testing. Carver argues statistical

significance simply means statistical rareness. A statistically significant difference may not be an important difference and trivial results are reported. This research will use cautious interpretations of statistically significant results to guard against reporting trivial results.

Herriott and Muse (1973, pp. 221-224) identify multicollinearity and autocorrelation as major problems in educational production function studies. Multicollinearity and autocorrelation will not seriously affect the major portion of this study which will be a bivariate analysis. Multicollinearity will be a concern in the multivariate analysis and some caution will be exercised to not use highly correlated (greater than $\pm$ .8) independent variables. Autocorrelation, the effect of a prior measure on the present measure, can be statistically controlled or analyzed as change variables. Haunshek (1979, p. 374) believes multicollinearity can be overcome by more careful selection of variables included in the multivariate analysis and use of better measures.

Procedural Steps in this Study

The analytical procedures outlines in this chapter were all used in this research. The hypotheses were tested using both correlation analysis and regression analysis. Both bivariate and multivariate regression analysis were used.

Initially, the bivariate relationships between predictor variables and school achievement were examined in

linear form using the Pearson Product Moment Correlation Coefficient as computed by the Statistical Package for the Social Sciences (Nie et al., 1975). Correlation coefficients were examined between the predictor variables for 1950, 1960, and 1970 with each year of school achievement from 1957 to 1976. Scatter diagrams were analyzed visually to determine the nature of the relationship, curvilinearity, and the form of any nonlinear relationships.

Predictor variables were transformed in logarithmic form and the relationship of this nonlinear form and achievement was analyzed. A Fortran program was written to compute Blalock's (1979, p. 425) test of the statistical significance of the difference between logarithmic and linear form. Bivariate regression analysis was used to analyze nonlinear relationships in the polynomial form.

Selected predictor variables with the strongest relationship with school achievement were graphed to analyze the time-lagged relationships. Bivariate regression analysis was used to compute the test alternative time lags between 1950-1970 and analyze the dynamics of neighborhood change.

Multiple regression analysis was used to test the stability of multivariate models. The "best" predictors of school achievement were identified for both 1960 and 1970 using the strongest linear, nonlinear, time-lagged, and change variables. A multivariate model combining family background and neighborhood factors with ability scores was analyzed.

Also, a multivariate model of family background and neighborhood factors testing lagged variables and the dynamics of change was analyzed.

The results of these analyses are reported in chapters V-VII.

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CHAPTER V

THE RELATIONSHIP BETWEEN SOCIAL CLASS AND SCHOOL ACHIEVEMENT

Descriptive Results

School Achievement

School achievement data were obtained on elementary schools in Kansas City for the period between 1957 and 1976. The school median on a standardized achievement test was obtained for each school. The data from 1957-1963 were from the Stanford Achievement Test and for 1964-1976 from the Iowa Tests of Basic Skills. The school median achievement score was obtained for grade six on reading comprehension. All elementary schools for which data were available were used in this study.

Table 2 contains the mean, standard deviation, and number of valid cases in the elementary school data base for each year between 1957 and 1976. The number of elementary schools reporting cases was different in various years due to consolidations, closures, and openings of schools or to a failure to report scores to the central office.

The mean achievement, expressed in grade equivalents, declined from 6.9 in 1957 to 5.0 in 1976. The testing dates vary somewhat between various years, but they were usually in February or March.

TABLE 2

MEAN AND STANDARD DEVIATIONS FOR SCHOOL ACHIEVEMENT, 1957-1976

Variable	Cases	Mean	Standard Deviation
PMTO1957	63	6.9302	1.2762
PMTO1958	75	6.7493	1.1909
PMTO1959	76	6.7934	1.2344
PMTO1960	76	6.7224	1.2365
PMTO1961	76	6.6579	1.2730
PMTO1962	78	6.6436	1.1521
PMTO1963	78	6.7064	1.2592
RCG61964	74	6.1189	.7210
RCG61965	78	5.9026	.8523
RCG61966	78	5.9974	.7082
RCG61967	79	5.9316	.7937
RCG61968	78	5.9077	.8173
RCG61969	77	5.7052	.8262
RCG61970	77	5.6584	.7568
RCG61971	77	5.5351	.7350
RCG61972	67	5.5612	.7901
RCG61973	68	6.1647	.8074
RCG61974	51	6.2039	.8662
RCG61975	62	6.5581	.8504
RCG61976	65	5.0200	.8180

Grade level for a school's median would generally be 6.6 or 6.7 in grade equivalents, meaning the median reading comprehension in a given school was grade six plus six or seven months. The mean for the district in 1957 was slightly above grade level, but by 1976, the mean of all elementary schools in the district was 1.5 grade equivalents below grade level.

The standard deviation of school medians was high in 1957 and declined generally through 1976. A high standard deviation indicates a wider scatter in school medians. By 1976, the scatter in school medians was not as great, indicating greater homogeneity among the school medians.

Generally, the mean achievement among the elementary attendance areas declined between 1957-1976. In 1973-1975, the mean achievement appeared to go up in the district. However, during these years, significant out-of-level testing and later testing occurred, making the results for these years not directly comparable. These years were eliminated from further analysis because of the measurement differences.

Alternative Social Class Measures

Table 3 contains the mean, standard deviation, and number of valid cases for the alternative social class measures for 1950-1970. Chapter III presented a definition for each measure and the applicable abbreviation. More valid cases appear in some years than for the comparable data on school achievement, and less appear in other years.

TABLE 3

MEAN AND STANDARD DEVIATIONS OF ALTERNATIVE SOCIAL CLASS MEASURES, 1950-1970

Variable	Cases	Mean	Standard Deviation
PCPROF70	79	9.0658	7.2827
PCMGR70	77	8.6182	11.9113
PCSALE70	73	6.1055	4.4843
PCCLER70	79	11.1013	4.1861
PCCRAF70	78	20.1769	7.0688
PCOPER70	79	16.8835	7.9247
PCLAB70	80	12.6975	7.2693
PCSERV70	80	13.5962	6.3377
PCPROF60	80	8.2375	5.6208
PCMGR60	80	9.5150	8.0404
PCSALE60	80	7.4875	4.4471
PCCLER60	80	11.7625	3.6781
PCCRAF60	81	18.9864	6.5860
PCOPER60	81	23.6185	9.1065
PCLAB60	81	10.3469	6.9781
PCSERV60	81	10.3136	6.6938
PCPROF50	72	7.9722	5.2357
PCMGR50	72	12.7958	9.3741
PCSALE50	72	9.2167	5.0853
PCCLER50	72	11.2833	3.7346
PCCRAF50	72	20.0125	6.6654

TABLE 3--Continued

Variable	Cases	Mean	Standard Deviation
PCOPER50	72	19.8306	8.0553
PCLAB50	72	10.0097	8.2011
PCSERV50	72	8.5792	6.4992
SER70	79	.8166	1.3596
PCUM70	80	17.2400	15.3761
PCLM70	79	16.6152	6.4710
PCUW70	80	40.6750	12.5132
PCLW70	80	26.7525	12.0992
PCMST70	79	36.4367	8.4060
PCLST70	80	47.5412	18.2719
PCHST70	80	17.5525	15.8157
SER60	81	1.1801	2.5417
PCUM60	81	17.3716	13.2521
PCLM60	80	19.2000	6.6193
PCLW60	81	20.7346	12.9062
PCMST60	80	38.3113	9.8386
PCLST60	80	44.3687	18.3756
PCHST60	80	17.3900	13.2664
SER50	72	1.6797	3.5558
PCUM50	72	20.7375	14.2751
PCLM50	72	20.4667	7.6359
PCUW50	72	39.8222	12.1365

TABLE 3--Continued

Variable	Cases	Mean	Standard Deviation
PCLW50	72	19.0847	14.2055
PCMST50	72	40.4583	10.4461
PCLST50	72	38.8528	19.8649
PCHST50	72	20.6764	14.2298

This is the result of data availability on a given set of census tracts that were aggregated into elementary attendance areas.

In 1950, data were reported on 96 census tracts compared to 136 census tracts in 1970. This means that some of the elementary school aggregates in 1950 had missing data because Census data were not available. In the bivariate analysis reported later in this chapter, pairwise deletion of missing data was used so that the maximum data available would be used in each pair. Pairwise deletion means that if a value is not present in a case for one variable in a pair, the case is eliminated from the analysis. Pairwise deletion cannot be used for multivariate analysis involving two or more predictors, so listwise deletion was used to eliminate all cases without valid data for each variable in the predictive model.

Table 3 shows that between 1950-1970 the mean percentage in lower status occupations or social class categories (e.g., PCLW, PCLST, PCLAB) tended to increase during the period for elementary attendance areas in Kansas City. Conversely, the higher status occupations or higher social class (e.g., PCHST, PCUM, PCPROF, PCMGR) generally declined. The socioeconomic ratio declined from a mean of 1.68 in 1950 to a mean of .82 in 1970. This seems to indicate the proportion of upper social class groups to lower social class groups declined in the elementary attendance areas during the 1950-1970 time period.

The standard deviations on the lower social class measures tended to decline only slightly between 1950-1970, while the higher social class measures increased slightly or remained stable in their social class status. The socioeconomic ratio had standard deviations with a greater relative decline than any of the other measures. The socioeconomic ratio is computed by weighting both extremes of the numbers in each occupational grouping and dividing the predominantly white-collar or middle-class occupations by the predominantly blue-collar or working-class occupations. A high standard deviation in the socioeconomic ratio in 1950 would indicate more heterogeneity among middle-class and working-class occupations for the elementary attendance areas. The lower standard deviation in 1970 would indicate more homogeneity. The percentages in a specific occupation

grouping or percent in a social class grouping do not appear to be as sensitive to this change.

Correlation Analysis Results

The initial analytical procedure was to conduct a correlation analysis of the three alternative sets of social class measures. In chapter III, a complete listing and definition of each set of measures was presented. The three alternative sets (Edwards, Havighurst, and Hodges) resulted in sixteen measures for each census period (1950, 1960 and 1970). Correlation coefficients were computed for each of the twenty years of school achievement data, resulting in 960 correlation coefficients. After visual examination of the results indicated continuity of results across years, and to facilitate analysis and presentation of data, a decision was made to report on five selected years between 1957-1976 (e.g., 1957, 1960, 1966, 1970 and 1976). The results discussed in this chapter (and chapter VI) will initially report the relationship between social class (or other socioeconomic measures) for 1950, 1960, and 1970 with school achievement for each of the selected years between 1957-1976. This will allow an examination of the relationship during selected years, the form of the relationship, and how lagging affects the relationship.

The alternative social class measures reported are those which had the strongest relationship with school

achievement (e.g., highest correlation). Higher social class or status measures and lower social class or status measures tended to have the strongest relationships with achievement and were consistently statistically significant. Middle class or status measures were not as strong in the relationship with achievement and were not as statistically significant as predictors, so these measures are not reported. To illustrate, the correlation between the Hodges' percent high status in 1970 (e.g., a higher social class measure) and school achievement in 1970 was .59; the correlation for percent low status and achievement was -.75; and the correlation for percent middle status and achievement was .51. In 1960, correlations of the same three measures with 1960 achievement were .76, -.81, and .49, respectively; and the correlations of 1950 measures with 1957 achievement were .80, -.86, and .51. Similar results were obtained for the middle status occupational groups (e.g., percent sales, percent clerical, percent craftsmen, and percent operatives) in Edwards' socioeconomic groupings and for the middle status groupings (percent lower middle class and percent upper working class) in Havighurst's groupings.

Linear Relationships

Lower status measures

As shown in table 4, all lower status or social class measures were statistically significant at better than the

.05 level with school achievement in the linear form. All lower status measures were also negatively correlated; the higher the achievement, the lower the percent in lower status occupations. Also, all lower status measures had correlations which declined in magnitude when time lags were present.

TABLE 4

CORRELATION COEFFICIENTS OF ALTERNATIVE SOCIAL CLASS MEASURES WITH SCHOOL ACHIEVEMENT BY SELECTED YEARS, 1957-1976, FOR LOWER STATUS MEASURES

	RCG61976	RCG61970	RCG61966	PMTO1960	PMTO1957
			1970		
PCLAB70	-.47***	-.72***	-	-	-
PCLW70	-.56***	-.76***	-	-	-
PCLST70	-.56***	-.75***			
			1960		
PCLAB60	-.33**	-.48***	-.65***	-.71***	-
PCLW60	-.40***	-.54***	-.65***	-.72***	-
PCLST60	-.37**	-.55***	-.73***	-.81***	-
			1950		
PCLAB50	-.23*	-.31*	-.52***	-.59***	-.78***
PCLW50	-.25*	-.36**	-.54***	-.61***	-.77***
PCLST50	-.34**	-.41***	-.64***	-.68***	-.86***

*p <.05
**p <.01
***p <.001

The percent lower working class (PCLW) and the percent lower status (PCLST) had the highest correlations with school achievement. PCLW70 was correlated at -.76 with 1970 achievement; PCLST60 was correlated at -.81 with 1960 achievement; and PCLST50 was correlated at -.86 with 1957 achievement.

Higher status measures

Table 5 contains the higher status or social class measures having the strongest relationship with school achievement for the selected years. The higher status measures were all positively correlated and statistically significant at better than the .001 level. PCHST70 and SER70 were correlated at .59 with 1970 achievement; PCHST60 was correlated at .76 with 1960 achievement; and PCPROF50 was correlated at .83 with 1957 achievement.

The socioeconomic ratio was positively correlated, and the correlation coefficient remained fairly stable between 1957-1976 at about .48 to .55. The percent professionals and percent high status had greater fluctuations and the coefficients generally declined over the selected years studied. Overall, the higher status measures in the linear form tended to have higher correlations with school achievement between 1957-1976 than did lower status measures. Time lag resulted in lower correlations for both higher and lower status measures. The correlations were in a direction consistent with theory.

TABLE 5

CORRELATION COEFFICIENTS OF ALTERNATIVE SOCIAL CLASS MEASURES WITH SCHOOL ACHIEVEMENT BY SELECTED YEARS, 1957-1976, FOR HIGHER STATUS MEASURES

	RCG61976	RCG61970	RCG61966	PMTO1960	PMTO1957
PCPROF70	.47***	.63***	-	-	-
PCHST70	.57***	.59***	-	-	-
SER70	.56***	.59***	-	-	-
			1960		
PCPROF60	.43***	.53***	.68***	.74***	-
PCHST60	.45***	.58***	.69***	.76***	-
SER60	.48***	.50***	.56***	.51***	-
			1950		
PCPROF50	.51***	.58***	.73***	.70***	.83***
PCHST50	.53***	.60***	.72***	.71***	.80***
SER50	.55***	.55***	.58***	.50***	.55***

***p <.001

Nonlinear Relationships

Scatter diagrams were examined and indicated some heteroscedasticity in lower status measures while higher status measures appeared more linear and had greater homoscedasticity. Curvilinearity, as discussed in chapter IV, can be tested by computing logarithmic and polynomial transformations after

examining scatter diagrams, to determine if a nonlinear relationship provides a better fit with the data. All of the alternative social class measures were tested for curvilinearity with the quadratic polynomial form and the logarithmic form. The transformed variables which resulted in a higher correlation over the linear form were further examined to see if the differences between the transformed and untransformed version of a given variable was statistically significant.

Logarithmic form

Four measures had statistically significant differences between the logarithmic form and linear form for some of the selected years between 1957-1976. Table 6 lists those measures that had higher correlations with school achievement in the logarithmic form. If the difference was statistically significant, it is shown in table 6.

The logarithmic form of the socioeconomic ratio was stronger than the linear form but tended to lose its difference and not be significant the longer the time lag. The logarithmic form of percent laborers and percent lower working class tended to be statistically significant for all selected years studied. The logarithmic form of percent low status was not significantly different from the linear form in 1960 and 1970. In 1966, 1970, and 1976, the logarithmic form of percent low status in 1950 was significant.

TABLE 6

CORRELATION COEFFICIENTS OF ALTERNATIVE SOCIAL CLASS MEASURES WITH SCHOOL ACHIEVEMENT, BY SELECTED YEARS, 1957-1976, FOR ALTERNATIVE SOCIAL CLASS MEASURES IN LOGARITHMIC FORM

	RCG61976	RCG61970	RCG61966	PMTO1960	PMTO1957
			1970		
LSER70	N.S.	.72#	-	-	-
LLAB70	-.58##	-.80##	-	-	-
LPCLW70	-.65###	-.82##	-	-	-
LPCLST70	N.S.	N.S.	-	-	-
			1960		
LSER60	N.S.	N.S.	.73##	.80###	-
LLAB60	N.S.	-.61###	-.75##	N.S.	-
LPCLW60	-.52##	-.65###	-.76###	-.80##	-
LPCLST60	-.46#	N.S.	N.S.	N.S.	-
			1950		
LSER50	N.S.	N.S.	N.S.	.71##	.85###
LLAB50	-.39#	-.46##	-.65##	-.69#	N.S.
LPCLW50	-.38##	-.50##	-.67###	-.71##	-.85##
LPCLST50	-.48##	-.54##	-.72#	N.S.	N.S.

NOTE: N.S.--Difference in logarithmic form not significant from linear form.

#p <.05 that difference in logarithmic form is statistically significant from linear form.

##p <.01

###p <.001

The logarithmic form of percent lower working class and percent laborers yielded similar correlations in the 1950 and 1960 measures, but the 1970 logged measure for percent lower working class was somewhat higher than the logarithmic form of percent laborers.

Quadratic polynomial form

All alternative social class measures were tested for curvilinearity in quadratic polynomial form. Multiple regression analysis was used for this purpose. In chapter IV, Kerlinger's (1973, p. 70) F test was discussed as the way to determine whether the addition of a second variable to a regression analysis improved the predictive relationship to a statistically significant level. The quadratic polynomial represents a second-order polynomial or squared term in the regression equation. The procedure is to enter the predictor variable on the first step of a regression analysis to predict school achievement, and on the second step the squared term is added. Only those social class measures where the polynomial term was a statistically significant addition to the prediction of school achievement are reported.

Table 7 illustrates the statistically significant social class measures in quadratic polynomial form for 1950-1970 with 1970 school achievement. The 1950-1960 social class measures in quadratic polynomial form with 1960 school achievement are in table 8.

TABLE 7

MULTIPLE REGRESSION ANALYSES OF SELECTED ALTERNATIVE SOCIAL CLASS MEASURES FOR SELECTED YEARS WITH SCHOOL ACHIEVEMENT, 1970 IN QUADRATIC POLYNOMIAL FORM

RCG61970 With	β	r	R^2	F	Level of Significance
		1970			
PCLW70	-2.30	-.76		64.26	
SQPCLW70	1.58	-.66	.70	30.40	<.001
PCHST70	1.45	.59		44.55	
SQPCHS70	- .95	.40	.48	18.73	<.001
		1960			
PCLW60	-2.19	-.54		38.16	
SQPCLW60	1.70	-.43	.46	22.90	<.001
PCLST60	-1.54	-.55		14.68	
SQPCLS60	1.03	-.48	.36	6.47	<.01
		1950			
SER50	1.32	.55		22.06	
SQSER50	- .83	.42	.38	8.60	<.001
PCPROF50	- .65	.58		3.98	
SQPROF50	1.28	.66	.47	15.51	<.001

Even though several measures are statistically significant in the quadratic polynomial form, the change in R^2 or explained variance is only trivial compared to the linear or logarithmic forms. The R^2 or explained variance refers to how well a variable, or set of variables, can explain or predict the

variance in the dependent variable. The correlation coefficient (r) can be squared in a bivariate relationship to obtain the R^2 or explained variance. The quadratic polynomial form results in a R^2 of .70 or 70 percent of the variance in 1970 achievement can be explained by this polynomial. However, the logarithmic form (LPCLW70) has an r of -.82 and a R^2 of .67. In the quadratic polynomial form, only 3 percent is added to explained variance and the degrees of freedom are less because two parameters are estimated. For these reasons, the logarithmic form is a stronger and a better predictor.

TABLE 8

MULTIPLE REGRESSION ANALYSES OF ALTERNATIVE SOCIAL CLASS MEASURES FOR SELECTED YEARS WITH SCHOOL ACHIEVEMENT, 1960 IN QUADRATIC POLYNOMIAL FORM

PMT01960 With	β	r	R^2	F	Level of Significance
			1960		
PCLAB60	-1.68	-.71		38.48	
SQLAB60	1.01	-.61	.59	13.79	<.001
PCHST60	1.34	.76		42.62	
SQPCHS60	- .62	.63	.62	9.19	<.001
			1950		
PCLST50	-1.65	-.68		20.45	
SQPCLS50	.99	-.60	.52	7.48	<.01

Comparison Between Linear and Nonlinear Relationships

Figure 1 illustrates a comparison of correlation coefficients between school achievement 1957-1976, and selected alternative social class measures for 1950, 1960, and 1970. The measures charted in figure 1 were the strongest predictors of school achievement over the time period in the linear or logarithmic form. The 1950 social class measures all had a similar pattern from 1957-1976, except after 1967 when the higher status measures for 1950 were better predictors. The lower status measure (logged percent lower working class) for 1960 was the best predictor for 1960-1970, and the lower status measure was also the best predictor in 1970-1976.

The strongest bivariate relationships between alternative social class measure and school achievement for 1950, 1960 and 1970 result in explained variances of 64 to 72 percent.

Regression Analysis

Tables 2 and 3 indicated a great deal of change between 1957-1976 in school achievement and between 1950-1970 in the alternative social class measures. Bivariate regression analysis was used as the analytic procedure to study the dynamics of change in school achievement (e.g., percent change in school achievement between two periods) and change in alternative social class measures (percent change between two periods).

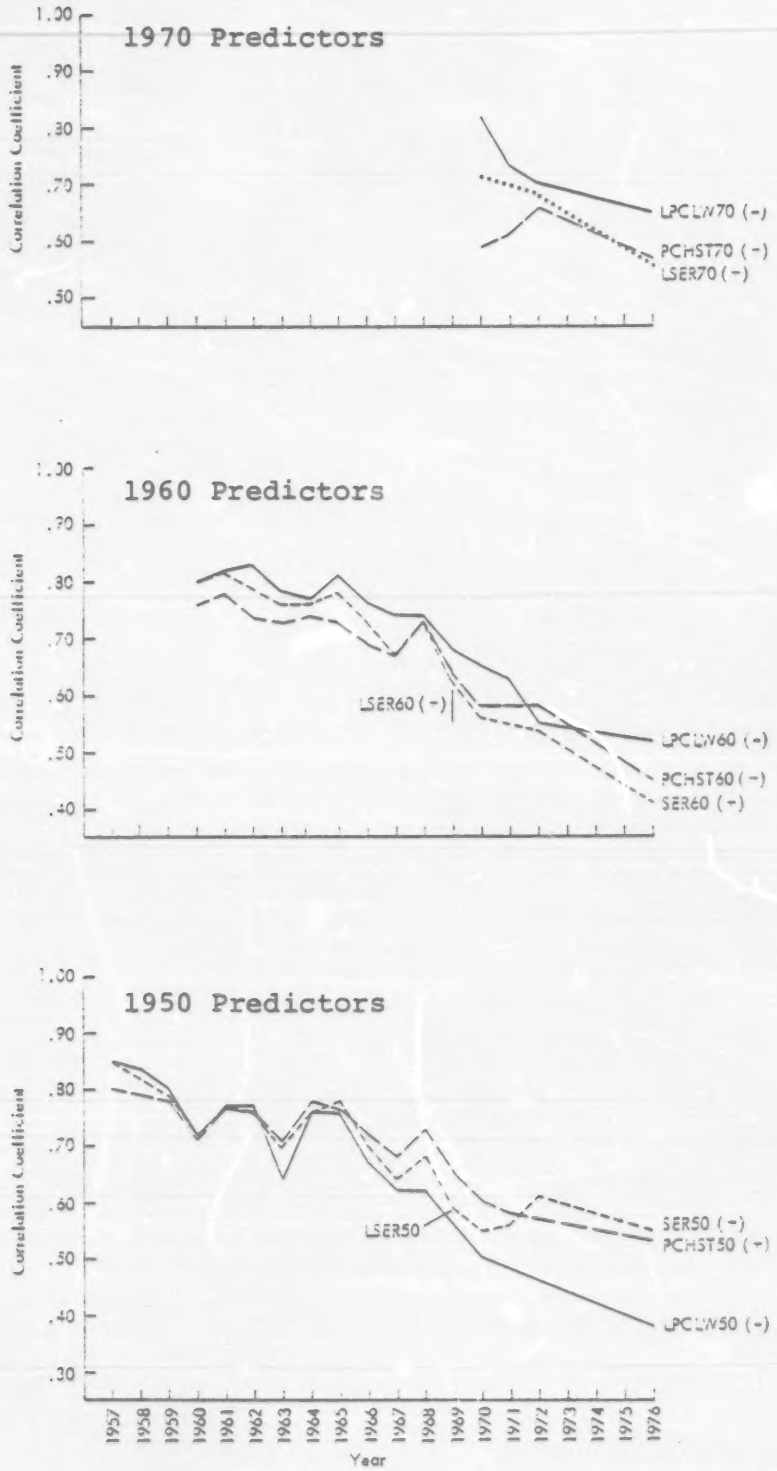

Fig. 1. Comparison between selected linear and nonlinear predictors 1950-1970 with school achievement 1957-1976

Bivariate regression analysis results in a standardized beta coefficient (equivalent to the correlation coefficient in bivariate regression), the R^2 or explained variance, and the F test of statistical significance of the regression equation. Chapter IV noted that regression analysis was concerned with how one variable explained or predicted another variable. Regression analysis was also used to examine the dynamics of change in achievement for 1970 and alternative social class measures while controlling for 1960 achievement. Only statistically significant results are reported.

Dynamics of Change

Percent change in achievement 1960-1970

Table 9 presents the results of the bivariate regression analyses of the percent change in school achievement between 1960-1970 and percent changes in alternative social class measures for 1960-1970, 1950-1960, and 1950-1970. The percent change in lower working class between 1960 and 1970 is the strongest predictor of 1960-1970 change in school achievement (R^2 = 27 percent) and percent change in lower status (R^2 = 29 percent) is almost as potent in predicting achievement. Other change variables which are statistically significant for the 1960-1970, 1950-1960, or 1950-1970 periods are significantly lower in explained variances.

TABLE 9

BIVARIATE REGRESSION ANALYSES OF CHANGE IN SCHOOL ACHIEVEMENT, 1960-1970 AND CHANGE IN ALTERNATIVE SOCIAL CLASS MEASURES, 1950-1970

	β	R^2	F	Level of Significance
Percent change in achievement, 1960-1970 with				
PCSECH6070	.35	.12	9.46	<.01
PCLBCH6070	-.52	.27	25.14	<.001
PCLWCH6070	-.55	.30	28.53	<.001
PCLSCH6070	-.53	.29	26.31	<.001
PCPFCH5060	-.26	.07	4.25	<.05
PCLBCH5070	-.33	.11	7.50	<.01
PCLWCH5070	-.28	.08	5.01	<.05
PCLSCH5070	-.35	.12	8.43	<.01

Percent change in achievement for alternative periods

Table 10 presents the results of bivariate regression analyses for other alternative periods. The other alternative periods for changes in school achievement include 1957-1976, 1957-1963, and 1960-1966. The best predictor for the 1957-1976 change in school achievement was the percent change in the socioeconomic ratio for 1950-1970 (R^2 = 23 percent).

TABLE 10

BIVARIATE REGRESSION ANALYSES OF CHANGE IN SCHOOL ACHIEVEMENT, 1957-1976 AND CHANGE IN ALTERNATIVE SOCIAL CLASS MEASURES, 1950-1970

	β	R^2	F	Level of Significance
Percent change in achievement, 1957-1976 with				
PCSECH5070	.48	.23	12.75	<.001
PCLWCH5070	-.34	.12	5.71	<.05
PCLSCH5070	-.33	.11	5.29	<.05
PCHSCH5070	.32	.10	4.97	<.05
Percent change in achievement, 1957-1963 with				
PCPFCH5060	.40	.16	9.56	<.01
PCLWCH5060	-.30	.09	4.95	<.05
Percent change in achievement, 1960-1966 with				
PCHSCH5060	.28	.08	5.32	<.05

The percent change in the lower status measures for 1950-1970 accounted for 10 to 12 percent explained variance in the change in school achievement 1957-1976. The best predictor for school achievement change in the 1957-1963 period was the percent change in professionals between 1950-1960. The only predictor statistically significant for percent change in 1960-1966 achievement was the percent change in high status

1950-1960 (R^2 = 8 percent). The results from the percent change in achievement for the alternative periods overall were lower than for the analyses of 1960-1970 change.

Dynamics of Change, Controlling for 1960 Achievement

Percent change in achievement 1960-1970, controlling for 1960 achievement

Multiple regression analysis was used to analyze the dynamics of change between 1960-1970 in school achievement and alternative social class measures, controlling for 1960 achievement. The F test outlined by Kerlinger (1973) was used to determine the statistical significance of the addition to explained variance, over the 1960 achievement, by the change variable.

The lower status social class measures were all statistically significant additions to explained variance of 1970 school achievement when controlling for 1960 achievement. The explained variance ranged from 54 to 58 percent. Table 11 presents these results.

Achievement 1970, controlling for 1960 achievement

Table 11 also presents results of multiple regression analyses of school achievement 1970 with the percent change between 1960-1970 in alternative social class measures, controlling for 1960 achievement.

TABLE 11

MULTIPLE REGRESSION ANALYSES OF DYNAMICS OF CHANGE BETWEEN SCHOOL ACHIEVEMENT, 1960-1970, CONTROLLING FOR 1960 ACHIEVEMENT, WITH ALTERNATIVE SOCIAL CLASS MEASURES, 1960-1970

	β	r	Cumulative RSQ	F	Level of Significance
Percent change in achievement, 1960-1970, controlling for 1960 achievement, with					
PMTO1960	-.58	-.69	.48	47.25	
PCLBCH6070	-.33	-.52	.58***	15.08	<.001
PMTO1960	-.56	-.69	.48	34.34	
PCLWCH6070	-.28	-.55	.54***	8.53	<.01
PMTO1960	-.57	-.69	.48	40.46	
PCLSCH6070	-.31	-.55	.56***	11.80	<.001
Achievement 1970, controlling for 1960 achievement, with					
PMTO1960	.65	.55	.30	41.07	
PCSECH6070	.30	.07	.38***	8.53	<.01
PMTO1960	.71	.55	.30	61.77	
PCLBCH6070	-.48	-.25	.50***	28.72	<.001
PMTO1960	.77	.55	.30	59.18	
PCLWCH6070	-.47	-.10	.47***	21.74	<.001
PMTO1960	.74	.55	.30	63.00	
PCLSCH6070	-.48	-.19	.50***	27.11	<.001

***Addition to R^2 p <.001

The percent change 1960-1970 in lower status measures and percent change in socioeconomic ratio 1960-1970 were all statistically significant additions to explained variance (R^2) after controlling for 1960 achievement. The percent change between 1960-1970 in socioeconomic ratio, percent lower working class, and percent lower status are not significantly correlated with 1970 school achievement. However, when these change variables are added to a regression equation controlling for 1960 achievement, they become statistically significant predictors. This indicates a suppressor relationship between the predictor variables and achievement. Kukuk, Levine, and Meyer (1979) presented several illustrations of suppressor variables. A suppressor variable increases the predictive ability of another variable by its inclusion in a regression equation (Kukuk et al., 1979, p. 1). The suppressor relationship usually exists in a three variable model with two predictors when the relationships (simple correlations) between the predictors and dependent variable differ in sign (Kukuk et al., 1979, p. 6).

Summary

A correlation analysis was conducted to study the relationship between alternative social class measures for 1950, 1960, and 1970 with school achievement for selected years between 1957-1976. Higher social status or social class measures were positively correlated in the linear form

with school achievement (range .43 to .83). These correlations were statistically significant at better than the .001 level and generally declined as the time lag was increased. However, one transformed higher social class measure, socioeconomic ratio in logarithmic form, was significant for selected years, but the longer the time lag, the more significant the linear form.

Lower social status or social class measures were negatively correlated with school achievement. The logarithmic form resulted in the highest correlations (range -.38 to -.85). Lower social status measures in the logarithmic form that were statistically significant included percent laborers logged, percent lower working class logged, and percent lower status logged.

The strongest bivariate relationships between alternative social class measures for 1950, 1960, and 1970 and selected years of school achievement for 1960 and 1970 resulted in explained variances of 64 to 72 percent.

The relationship between percent change in school achievement with percent change in predictor variables resulted in explained variances ranging from 8 to 23 percent. When change in achievement between 1960-1970 was controlled for 1960 achievement, the percent change in predictor variables added to explained variances (range of predictors with 1960 achievement was 54 to 58 percent). When 1970 achievement was controlled for 1960 achievement, the percent change in

predictor variables added to explained variances (range 38 to 50 percent for 1960 achievement with change variables). Change variables between 1960-1970 were not correlated with 1970 achievement at a statistically significant level. When 1960 achievement was controlled for, the 1960-1970 change variables became statistically significant, indicating a suppressor relationship between 1960 achievement and the 1960-1970 change variables in explaining 1970 achievement.

CHAPTER VI

THE RELATIONSHIP BETWEEN SELECTED SOCIOECONOMIC MEASURES AND SOCIAL ACHIEVEMENT

Descriptive Results

Chapter III described the selected socioeconomic measures to represent race, education, income, density, and housing value. These socioeconomic measures were selected after a review of previous educational production function studies and based on the availability of data for the measures from the 1950, 1960 and 1970 census.

Of the original eleven selected socioeconomic measures identified in chapter III, table 1, only six are presented in this chapter. Initial analysis of all eleven measures determined that five measures could be eliminated from further consideration. Three of these measures (percent black renter-occupied housing units, median education, and median value renter-occupied housing units) were very highly correlated with the measures presented in this chapter.

Correlations of these three measures with a similar retained measure ranged from .88 to .99. Correlations this high usually indicate the two measures are so highly related that they measure essentially the same thing. The percent in the total black population is a part of the measure percent

black renter-occupied housing units. The median value of owner-occupied housing units correlates highly (greater than .88) with the median value of renter-occupied housing units. Also, the median education of the population twenty-five years and older was highly related to the percent high school graduates ($r = .95$). In choosing which measure to eliminate, the criterion was to retain the one with the strongest (highest correlation) relationship to school achievement.

Two measures were eliminated from further analysis because the measures were not highly correlated with school achievement or statistically significant at better than the .05 level. These measures were the percent population five to nineteen years old enrolled in public school and the percent of occupied housing units with six or more persons. The lack of a statistically significant relationship may mean that these measures are not generally related to school achievement, are not good predictors for Kansas City, or suffered from measurement error.

Table 12 contains the means, standard deviations, and valid cases for each of the six selected socioeconomic measures for the 1950-1970 period. The mean for percent total black population in the elementary attendance areas increased from 11 percent in 1950 to 33 percent in 1970. The standard deviations for percent black also increased, indicating a greater dispersion among elementary attendance areas.

TABLE 12

MEAN AND STANDARD DEVIATIONS FOR SELECTED SOCIOECONOMIC MEASURES, 1950-1970

Variable	Cases	Mean	Standard Deviation
PCBLK70	81	32.9704	38.2076
PCHSG70	80	44.5362	15.3111
MDINC70	79	8469.1266	2771.1798
PCHUV70	81	9.1296	6.7275
PROOM70	80	8.8050	5.8143
MDVOHU70	79	10872.1519	4175.8213
PCBLK60	81	19.2506	30.4669
PCHSG60	81	40.9877	15.4529
MDINC60	79	5788.3291	2102.0239
PCHUV60	81	4.3889	3.9939
PROOM60	81	10.2025	6.1536
MDVOHU60	78	9933.3333	3562.9284
PCBLK50	81	11.2889	22.3967
PCHSG50	74	41.4919	16.5609
MDINC50	74	3184.6757	1305.5789
PCHUV50	81	.8173	.9114
PROOM50	74	13.2608	8.5227
MDVOHU50	68	6862.6765	3065.4264

The mean percent high school graduates increased slightly from 1950-1970 and the standard deviation declined. The mean of median family income and median value of owner occupied housing increased from 1950-1970 and the standard deviation increased for both measures, indicating a greater dispersion in housing values and income among the elementary attendance areas in 1970 versus 1950.

The mean and standard deviation of density measures indicated some interesting change between 1950-1970. The mean percent housing units vacant increased from .8 percent in 1950 to 9.1 percent in 1970. This indicated that more elementary areas had high percentages of housing units vacant in 1970 than in 1950, indicating some decrease in density. The mean percent housing units with greater than 1.01 or more persons per room declined from 13 percent in 1950 to 9 percent in 1970. This also indicates a lessening of density in housing units among the elementary attendance areas between 1950-1970.

Correlation Analysis Results

Linear and Nonlinear Relationships

Race

Table 13 illustrates the relationship between race and school achievement for selected years 1957-1976. Race was a statistically significant predictor of school achievement in the linear form at better than the .01 level.

TABLE 13

CORRELATION COEFFICIENTS OF RACE WITH SCHOOL ACHIEVEMENT BY SELECTED YEARS, 1957-1976

	RCG61976	RCG61970	RCG61966	PMT01960	PMT01957
			Linear Form		
PCBLK70	-.44***	-.65***	-	-	-
PCBLK60	-.26**	-.42***	-.50***	-.54***	-
PCBLK50	N.S.	-.26**	-.37***	-.48***	-.52***
			Logarithmic Form		
LPCBK70	-.57#	N.S.	-	-	-
LPCBK60	N.S.	-.54#	-.66##	-.65#	-
LPCBK50	N.S.	N.S.	N.S.	N.S.	N.S.

NOTE: N.S.--Correlation coefficients in linear form not significant or difference in logarithmic form not significantly different from linear form.

*p <.05
**p <.01
***p <.001

#p <.05 that difference is statistically significant from linear form.
##p <.01 that difference is statistically significant from linear form.
###p <.001 that difference is statistically significant from linear form.

The correlations of race in 1970 with achievement were higher than in 1950 and 1960. The logarithmic form of race was generally not different from the linear form at a statistically significant level except for 1960. The logarithmic form of race in 1960 was correlated with 1960 achievement at -.65; the linear form in 1970 was also correlated at -.65. Race in 1960 and 1970 accounted for about 42 percent of the variance in school achievement. The negative relationship means that the higher the percent black population in an elementary attendance area, the lower the school achievement.

Education

Education was positively related to school achievement in linear form in the selected years between 1957-1976. As shown in table 14, education in 1950, 1960, and 1970 was a stronger predictor of school achievement than race.

TABLE 14

CORRELATION COEFFICIENTS OF EDUCATION WITH SCHOOL ACHIEVEMENT BY SELECTED YEARS, 1957-1976

	RCG61976	RCG61970	RCG61966	PMTO1960	PMTO1957
PCHSG70	.51***	.62***	-	-	-
PCHSG60	.41***	.50***	.72***	.74***	-
PCHSG50	.43***	.45***	.66***	.63***	.84***

***All correlation coefficients statistically significant at .001 level in linear form.

Education in 1950 was correlated with 1957 school achievement at .84; education in 1960 was correlated with 1960 achievement at .74; and education in 1970 with 1970 achievement at .62. Education was a stronger predictor in 1950 but became less potent by 1970.

None of the nonlinear relationships in logarithmic form were higher than the linear form or different at a statistically significant level.

Income

Income was also positively correlated in the linear form with school achievement in the selected years 1957-1976. The nonlinear relationships of income with school achievement in logarithmic form were not different at a statistically significant level. Over the selected years, 1957-1976, income was a stronger predictor of school achievement than race or education. Table 15 presents the results of the relationship between income and school achievement. In 1970, income was correlated at .71 with 1970 school achievement and accounted for about 50 percent of variance in school achievement.

Density

Tables 16 and 17 contain the correlations of the two density measures (percent occupied housing units with greater than 1.01 person per room PROOM, and percent occupied housing units vacant, PCHUV) with school achievement for the selected years 1957-1976 in both linear and nonlinear, logarithmic form.

TABLE 15

CORRELATION COEFFICIENTS OF INCOME WITH SCHOOL ACHIEVEMENT BY SELECTED YEARS, 1957-1976

	RCG61976	RCG61970	RCG61966	PMTO1960	RMTO1957
MDINC70	.66***	.71***	-	-	-
MDINC60	.55***	.60***	.69***	.63***	-
MDINC50	.60***	.59***	.70***	.65***	.72***

***All correlation coefficients statistically significant at .001 level in linear form.

In the linear form, PROOM was a stronger predictor over the 1957-1976 period with school achievement in comparison to PCHUV. PROOM was also a stronger predictor of achievement in logarithmic form than was PCHUV, except in 1970.

The logarithmic form of PROOM for 1960 was correlated with 1960 achievement at -.73; in 1970, PROOM in logarithmic form was correlated with 1970 achievement at -.62. The logarithmic form of PCHUV in 1960 was correlated with 1960 achievement at -.62; in 1970, PCHUV in logarithmic form was correlated with school achievement at -.71. This result generally indicates that density as measured by crowded housing (logarithmic form of percent units with greater than 1.01 persons per room) was not as strong a predictor of achievement in 1970 as it had been in 1960. However, in 1970, density as measured by the logarithmic form of percent housing units vacant, was a stronger predictor of school achievement than it had been in 1960.

TABLE 16

CORRELATION COEFFICIENTS OF DENSITY WITH SCHOOL ACHIEVEMENT BY SELECTED YEARS, 1957-1976

	RCG61976	RCG61970	RCG61966	PMTO1960	PMTO1957
			Linear Form		
PROOM70	-.20*	-.41***	-	-	-
PROOM60	-.30**	-.40***	-.60***	-.64***	-
PROOM50	-.27*	-.27*	-.53***	-.58***	-.77***
			Logarithmic Form		
LPROOM70	-.38###	-.62###	-	-	-
LPROOM60	N.S.	-.51#	-.69#	-.73##	-
LPROOM50	-.41#	-.44##	-.63#	-.69#	N.S.

NOTE: N.S.--Correlation coefficients in linear form not significant or difference in logarithmic form not significantly different from linear form.

*p <.05
**p <.01
***p <.001

#p <.05 that difference is statistically significant from linear form.
##p <.01 that difference is statistically significant from linear form.
###p <.001 that difference is statistically significant from linear form.

TABLE 17

CORRELATION COEFFICIENTS OF HOUSING VACANCY WITH SCHOOL ACHIEVEMENT BY SELECTED YEARS, 1957-1976

	RCG61976	RCG61970	RCG61966	PMTO1960	PMTO1957
			Linear Form		
RCHUV70	-.55***	-.63***	-	-	-
PCHUV60	-.36**	-.44***	-.43***	-.48***	N.S.
PCHUV50	N.S.	N.S.	.23*	N.S.	N.S.
			Logarithmic Form		
LPHUV70	N.S.	-.71#	-	-	-
LPHUV60	N.S.	-.58##	-.58##	-.62##	-
LPHUV50	.31##	N.S.	N.S.	N.S.	N.S.

NOTE: N.S.--Correlation coefficients in linear form not significant or difference in logarithmic form not significantly different from linear form.

*p <.05
**p <.01
***p <.001

#p <.05 that difference is statistically significant from linear form.
##p <.01 that difference is statistically significant from linear form.
###p <.001 that difference is statistically significant from linear form.

A high percentage of vacant housing units and high percentages of crowded housing are often considered to be less than desirable living conditions in central cities.

Density in 1970 explained or predicted 50 percent of variance in 1970 school achievement among elementary attendance areas using the logarithmic form of PCHUV. PROOM in logarithmic form in 1970 explained or predicted 38 percent of variance in 1970 school achievement. PCHUV as a density measure was equally as potent a predictor of school achievement in 1970 as income. PCHUV and PROOM were not highly correlated with each other during the 1950-1970 period ($r = .28$ in 1970, .25 in 1960, and -.04 in 1950).

Housing value

Housing value (median value of owner-occupied housing) was positively correlated with school achievement for selected years 1957-1976 in both linear and nonlinear, logarithmic form. As shown in table 18, the linear form had the strongest relationship with school achievement for all years except 1950. The 1950 logarithmic form of housing value was correlated .79 with 1957 school achievement. In 1960 and 1970, the linear form of housing value for 1960 and 1970 was correlated at .70 with school achievement and explained 49 percent of the variance in school achievement in 1960 and 1970.

TABLE 18

CORRELATION COEFFICIENTS OF HOUSING VALUE WITH SCHOOL ACHIEVEMENT BY SELECTED YEARS, 1957-1976

	RCG61976	RCG61970	RCG61966	PMTO1960	PMTO1957
			Linear Form		
MDVOHU70	.65***	.70***	-	-	-
MDVOHU60	.54***	.58***	.75***	.70***	-
MDVOHU50	.53***	.52***	.69***	.68***	.74***
			Logarithmic Form		
LMDOH70	N.S.	N.S.	-	-	-
LMDOH60	N.S.	N.S.	N.S.	N.S.	-
LMDOH50	N.S.	N.S.	N.S.	N.S.	.79#

NOTE: N.S.--Correlation coefficients in linear form not significant or difference in logarithmic form not significantly different from linear form.

*p <.05
**p <.01
***p <.001

#p <.05 that difference is statistically significant from linear form.
##p <.01 that difference is statistically significant from linear form.
###p <.001 that difference is statistically significant from linear form.

Comparison Between Best Linear and Nonlinear Measures

Figure 2 illustrates the correlation coefficients for the best linear and nonlinear measures for 1950, 1960 and 1970 with school achievement 1957-1976. In 1970, the linear form of income and housing values were the best or strongest predictor of school achievement. Among the 1960 predictors, education was a slightly better predictor than the other measures between 1960-1965 but dropped off in the later years. The 1960 income and housing value measures were the strongest predictors of achievement during the 1960-1976 period. For 1950 predictors, education and density were the strongest predictors of 1957-1960 achievement, were equal to income and housing values as predictors of 1960-1966 achievement, but dropped off as predictors of 1966-1976 achievement. The 1966-1976 achievement scores were best predicted by the 1950 measures for income and housing value. Race was the weakest of the five 1950 and 1960 predictors for 1957-1976 achievement and in the middle as a predictor for 1970 for 1970-1976 achievement. Comparing the five predictors in linear and nonlinear form results in the interpretation that significant change was occurring among the elementary attendance areas in selected predictors. The next section will examine the dynamics of change relationships.

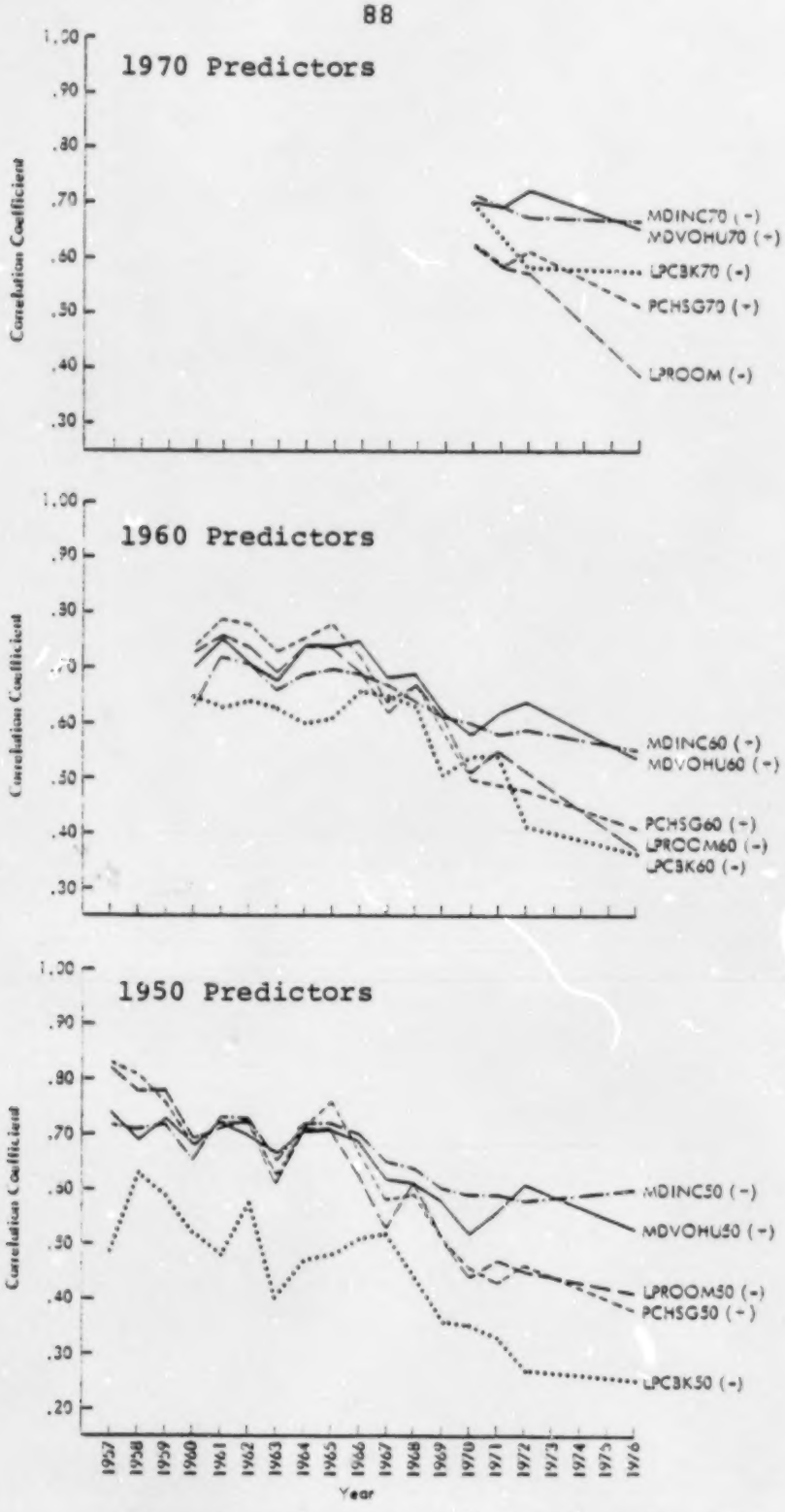

Fig. 2. Comparison between selected linear and nonlinear predictors 1950-1970 with school achievement 1957-1976

Regression Analysis

Dynamics of Change

Percent change in achievement 1960-1970

Table 19 presents the results of bivariate regression analyses of the percent change in school achievement 1960-1970 with the percent change in selected socioeconomic measures 1960-1970 and 1950-1970 as predictors.

TABLE 19

BIVARIATE REGRESSION ANALYSES OF CHANGE IN SCHOOL ACHIEVEMENT, 1960-1970 AND CHANGE IN SELECTED SOCIOECONOMIC MEASURES, 1950-1970

	β	R^2	F	Level of Significance
Percent change in achievement, 1960-1970 with				
PCBKCH6070	-.27	.07	5.34	<.05
PCHGCH6070	.31	.09	6.87	<.05
PCINCH6070	.28	.08	5.89	<.05
PCHVCH6070	-.39	.15	12.19	<.001
PCINCH5070	.32	.10	7.25	<.01
PCPRCH5070	-.27	.07	4.88	<.05

Changes between 1960-1970 in race, education, income, and housing value were statistically significant predictors at the .05 level of 1960-1970 change in school achievement. However, the best predictor, 1960-1970 precent change in housing value, only explained or predicted 15 percent of the variance in the percent change in school achievement. The percent change in income and density between 1950-1970 were statistically significant at the .05 level of 1960-1970 percent change in school achievement. The 1950-1970 percent change in income explained or predicted 10 percent of the variance in 1960-1970 percent change in school achievement.

Percent change in achievement for other periods

Other alternative periods of percent change in achievement between 1957-1976 were studied. As shown in table 20, the percent change in income 1950-1970 explained or predicted 18 percent of the variance in 1957-1976 percent change in school achievement. The 1950-1960 percent change in housing value explained or predicted 12 percent of variance in 1960-1966 school achivement. Both were statistically significant predictors of school achievement at better than the .01 level.

TABLE 20

BIVARIATE REGRESSION ANALYSES OF CHANGE IN SCHOOL ACHIEVEMENT, 1957-1976 AND CHANGE IN SELECTED SOCIOECONOMIC MEASURES, 1950-1970

	β	R^2	F	Level of Significance
Percent change in achievement, 1957-1976 with				
PCINCH5070	.42	.18	9.43	<.01
Percent change in achievement, 1960-1966 with				
PCHVCH5060	.35	.12	9.60	<.01

Dynamics of Change, Controlling for 1960 Achievement

Percent change in achievement, 1960-1970, controlling for 1960 achievement

Table 21 presents results of multiple regression analyses of percent change in school achievement 1960-1970, controlling for 1960 achievement, with 1960-1970 percent change in selected socioeconomic measures. The percent change 1960-1970 in income, density (percent housing units vacant), and housing value were all statistically significant predictors at better than the .05 level of the percent change in achievement 1960-1970 after controlling for 1960 achievement.

TABLE 21

MULTIPLE REGRESSION ANALYSES OF CHANGE IN SCHOOL ACHIEVEMENT, 1960-1970, CONTROLLING FOR 1960 ACHIEVEMENT, WITH CHANGE IN SELECTED SOCIO-ECONOMIC MEASURES, 1960-1970

	β	r	Cumulative RSQ	F	Level of Significance
Percent change in achievement, 1960-1970, controlling for 1960 achievement, with					
PMTO1960	-.66	-.69	.48	57.65	
PCINCH6070	.18	.28	.51**	4.03	<.05
PMTO1960	-.64	-.69	.48	56.48	
PCHVCH6070	-.25	-.39	.54**	8.81	<.001
PMTO1960	-.70	-.69	.48	64.03	
PCOHCH6070	.22	.20	.54**	6.41	<.01
Achievement 1970, controlling for 1960 achievement, with					
PMTO1960	.61	.55	.30	37.87	
PCHGCH6070	.26	.10	.36**	6.77	<.01
PMTO1960	.58	.55	.30	34.00	
PCINCH6070	.20	.10	.36**	4.03	<.05
PMTO1960	.61	.55	.30	39.24	
PCHVCH6070	-.29	-.16	.38**	8.83	<.001
PMTO1960	.54	.55	.30	31.68	
PCOHCH6070	.33	.34	.41**	11.90	<.001

**Addition to R^2 p <.001

The 1960-1970 percent change in housing value and density each explained 54 percent of variance in school achievement change between 1960-1970, after controlling for 1960 achievement. The addition of 6 percent to R^2 or explained variance by the percent change 1960-1970 in density and housing value was statistically significant at better than the .05 level.

Achievement, 1970, controlling for 1960 achievement

Also in table 21, results of multiple regression analyses of school achievement 1970 after controlling for 1960 achievement, with the percent change 1960-1970 in selected socioeconomic measures, are presented. The percent change 1960-1970 in education, income, density, and housing value were all statistically significant predictors of school achievement in 1970, after controlling for 1960 achievement. The percent change in housing value 1960-1970 was the best predictor and explained 41 percent of the variance in 1970 school achievement, controlling for 1960 achievement. The addition of 11 percent to R^2 was statistically significant at better than the .01 level. The suppressor relationship noted earlier is also present here, especially between education, income and density as predictors of 1970 achievement controlling for 1960 achievement.

Summary

A correlation analysis was used to study the relationship of socioeconomic measures for 1950, 1960, and 1970 selected from previous research with school achievement for selected years between 1957-1976. The selected socioeconomic measures included race (percent black), education (percent high school graduates), income (median family income), density (two measures used--percent housing units vacant and the percent housing units with greater than 1.01 persons per room), and housing value (median value of owner-occupied housing). All socioeconomic measures were generally statistically significant predictors of school achievement at better than the .01 level.

Race was negatively correlated with school achievement. The logarithmic form of race generally was not a better predictor of school achievement except in 1960 (-.65). The best linear predictor of school achievement in 1970 was the PCBLK for 1970 at -.65, or 42 percent of variance explained.

Education was positively correlated with school achievement and the linear form yielded the highest correlations for selected years between 1957-1976. Overall, education was a stronger predictor of school achievement than race. Education for 1950 was correlated with 1957 school achievement at .84 or 71 percent of variance in school achievement in 1957 was explained by the education measure for 1950. By 1970, education was a less potent predictor, with the 1970 education

measure correlated with school achievement at .62 or 38 percent explained variance.

Income was positively correlated with school achievement and the linear form yielded the highest correlations. Income in 1970 was correlated with 1970 school achievement at .71, or about 50 percent of variance in school achievement in 1970 was accounted for by income in 1970.

Both density measures (PROOM and PCHUV) were negatively correlated with school achievement for the period. PROOM was a stronger predictor of school achievement in logarithmic form than the logarithmic form of PCHUV except in 1970. The logarithmic form of PCHUV in 1970 was the best predictor of school achievement in 1970. PCHUV in 1970 was correlated at -.71 with 1970 school achievement, or accounted for 50 percent of variance in school achievement.

The linear form of housing value was the strongest predictor of school achievement and was positively correlated. Housing value in 1970 was correlated with 1970 achievement at .70, or 49 percent variance explained.

Using 1950, 1960, and 1970 measures, housing value and income were generally the overall best predictors of school achievement for 1957-1976 period.

In analyses of percent change in school achievement 1960-1970, the 1960-1970 percent change in housing value was the best predictor and explained 15 percent of the variance in 1960-1970 percent achievement change. The percent change

1960-1970 in density (PCHUV) and housing value were the best predictors of the 1960-1970 change in school achievement, controlling for 1960 achievement. Each, together with 1960 achievement, explained 54 percent of the variance in percent change in achievement 1960-1970.

CHAPTER VII

THE RELATIONSHIP BETWEEN STUDENT ABILITY AND SCHOOL ACHIEVEMENT

This research has primarily focused on the relationship of family background and neighborhood factors to school achievement. Hanushek (1979, p. 364) pointed out that educational production function studies have concentrated on family background influences, peer influences, and school inputs. He states that a consistent weakness in educational production function studies is the lack of a measure of innate ability of students. The omission of an important variable can result in bias in reporting of research into the educational production function. This chapter reports results of how student ability was related to school achievement 1957-1976 in Kansas City.

Conceptual Issues

Otis (1954, p. 1) pointed out that it is not possible to directly measure student ability. He developed a series of quick-scoring group mental ability tests to measure mental ability. Anderson and Faust (1973, p. 106) stated that mental ability tests provide rough measures of student aptitude but serve as relatively good predictors of future academic success.

Anderson et al. also pointed out that mental ability tests differ from standardized achievement tests mainly in degree of specific attainments being measured. Lorge, Thorndike, and Hagen (1964, p. 38) noted a strong relationship between mental ability or intelligence test scores and achievement. Students who score high on mental ability or intelligence tests usually score high on achievement tests. Comparisons between mental ability tests and achievement tests should be broad since both contain measurement error.

Anderson and Faust (1973, p. 107) found most mental ability tests yielded an intelligence quotient (IQ) or score which could serve as an index of general scholastic ability. Also, some mental ability tests have a verbal and nonverbal IQ score. The verbal score measures language-related abilities and proves to be an excellent predictor of school success.

Lorge et al. (1964, p. 38) cited mental ability or intelligence as an important but not the only determinant of school achievement. Other factors they believe are important determinants of school achievement include: home background, socioeconomic status or social class, physical and mental health, and a student's previous experience.

Lorge et al. (1964, p. 40) offered several cautions on the use and interpretation of mental ability tests. These cautions include: no mental ability test will measure the innate ability of an individual; all measurement contains errors; mental ability tests are not absolute predictors of

academic success; and verbal scores should not be uncritically accepted for individuals who are poor readers or do not speak English.

Otis (1954, p. 8) reported a correlation of .83 between reading comprehension for grade five on his mental ability test and the Stanford Achievement Tests. The Lorge-Thorndike Intelligence Tests (Lorge et al., 1964, p. 38) were standardized with the Iowa Tests of Basic Skills, an achievement battery, so generally yield high correlations with achievement.

Descriptive Results

Source of Data

An ability measure was obtained for selected years for each elementary school based on standardized tests of mental ability. Kansas City used the Otis Quick Scoring Test of Mental Ability between 1957-1963, the Lorge-Thorndike Intelligence Test between 1964-1968 and 1970-1973, and the Cognitive Abilities Test between 1974-1975 and 1976. The Otis and Lorge-Thorndike were given in grade five during the period. The Cognitive Abilities Test (CAT) was given in grade five in 1974 and 1975, and in grade three in 1976. The Otis and Lorge-Thorndike tests yielded a school median intelligence quotient or IQ score. The CAT only reported a median grade percentile score in the years available.

In this study, the grade five school medians for each elementary school were obtained for 1957, 1959, 1961, 1963, 1967, and 1971. The grade four school medians for each elementary school were obtained for 1974. The grade five school medians were lagged one year and used to predict the following year's school achievement (e.g., 1967 ability score for grade five used to predict 1968 achievement score for grade six). The 1974 grade four scores were lagged two years to predict 1976 school achievement. This procedure was necessary because no ability tests scores were available for grade six.

One additional factor affecting test results was the time of year the tests were administered. In the selected years, the Otis was generally administered in October and the Lorge-Thorndike in November in the years when it was used. The Cognitive Abilities Test was administered in February in the year selected. The relationship between these testing dates and the dates for the achievement tests builds some measurement error into the data due to attrition of students between testing dates.

Characteristics of Data

Table 22 presents the number of valid cases (elementary schools), means, and standard deviations for the mental test data. The Otis scores reported for 1957-1963 are single IQ measures reported on each elementary school.

TABLE 22

MEAN AND STANDARD DEVIATIONS FOR ABILITY SCORES FOR SELECTED YEARS, 1957-1974

Variable	Cases	Mean	Standard Deviation
OMATG557	74	102.1081	5.5111
OMATG559	75	102.0267	5.4326
OMATG561	77	101.2857	5.4189
OMATG563	79	101.6076	5.6804
LTVEG567	78	95.9872	7.2712
LTVEG571	77	93.8182	6.9372
CATVG474	69	35.0580	18.3374

The mean of school median IQ scores between 1957-1963 remained fairly stable with a slight decline from 102.1 to 101.6. The Lorge-Thorndike IQ scores reported are for verbal ability only and showed a slight decline from 1967 to 1971 from 95.9 to 93.8. The Cognitive Abilities Test (CAT) score for 1974 was a verbal score expressed as a median grade percentile. The CAT score cannot be compared with other mental ability scores reported because it doesn't account for mental age. The CAT score also shows a high standard deviation. This score was eliminated from further analysis because of this discrepancy and problems with out-of-level achievement testing in 1974.

Figure 3 illustrates the relationship between the mental ability (IQ) test score in 1959 for grade five with school achievement in 1960 for grade 6. The scatter diagram illustrates a strong positive linear relationship with a generally homoscedastic dispersion. The next section will discuss the results of the correlation analyses for the selected years.

Correlation Analysis Results

Ability scores were positively correlated with school achievement in each of the selected years between 1957-1972. As shown in table 23, ability scores were highly correlated with school achievement at better than a .001 level of statistical significance. Ability scores were able to explain or predict 76 to 81 percent of variance in school achievement.

TABLE 23

CORRELATION COEFFICIENTS OF ABILITY SCORES WITH SCHOOL ACHIEVEMENT FOR SELECTED YEARS, 1957-1972

	RCG61972	RCG61968	RCG61964	PMTO1962	PMTO1960	PMTO1958
LTVEG571	.89***					
LTVEG567		.88***				
OMATG563			.89***			
OMATG561				.87***		
OMATG559					.87***	
OMATG557						.90***

***p <.001

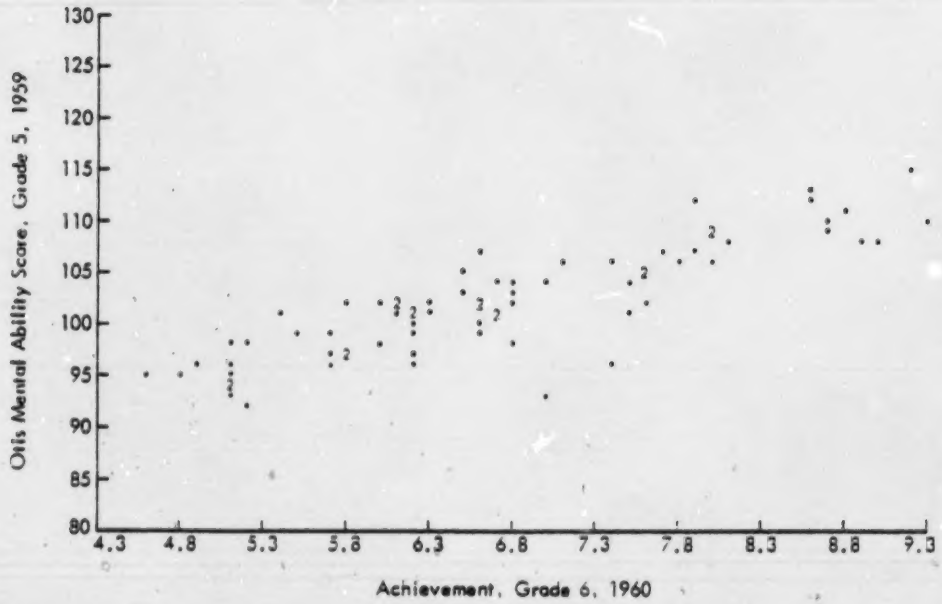

Fig. 3. Scatter diagram comparing relationship between mental ability scores and school achievement, 1970

Part of the unexplained variance was probably due to measurement errors, lagging, and attrition in the groups taking the tests.

Regression Analysis Results

Ability Scores With Family Background and Neighborhood Factors

1970 achievement

Ability scores were combined with family background and neighborhood factors to analyze their relative contribution in explaining or predicting 1970 school achievement. A 1969 grade five ability score was not available so a grade three score was obtained for 1967 and used to predict 1970 achievement. The 1967 grade three Lorge-Thorndike ability score was correlated at .79 with 1970 achievement. Stepwise multiple regression analysis was used to analyze the multivariate relationship between ability scores, family background, and school achievement.

Table 24 presents the results of the multivariate analysis of school achievement in 1970 with ability scores and selected background measures as predictors. The best predictive model in 1970 included social class (percent lower working class, logged), the 1967 ability scores for grade three, and race (percent black population). The predictive model was statistically significant at better than the .001 level and explained 78 percent of the variance in 1970 school achievement. The addition to the R^2 or explained variance

was also statistically significant at better than the .001 level.

TABLE 24

STEPWISE MULTIPLE REGRESSION ANALYSIS OF SCHOOL ACHIEVEMENT, 1970, WITH ABILITY SCORES AND SELECTED BACKGROUND MEASURES AS PREDICTORS

RCG61970 with	β	r	Cumulative RSQ	F	Level of Significance
LPCLW70	-.26	-.82	.67	4.85	
LTVEG367	.50	.82	.75	27.14	
PCBLK70	-.24	-.65	.78***	8.17	<.001

***Addition to R^2 p <.001

1960 achievement

Table 25 illustrates a stepwise multiple regression analysis of school achievement, 1960, with ability scores and the best family background predictors. The ability score (Otis mental ability test, grade five, 1959) and social class (percent high status, 1960) explained 77 percent of the variance in 1960 school achievement. The 1960 predictive model was statistically significant at better than the .001 level. Tne addition to the R^2 or explained variance was statistically significant at better than the .001 level.

TABLE 25

STEPWISE MULTIPLE REGRESSION ANALYSIS OF SCHOOL ACHIEVEMENT, 1960, WITH ABILITY SCORES AND SELECTED BACKGROUND MEASURES AS PREDICTORS

PMTO1960 with	β	r	Cumulative RSQ	F	Level of Significance
OMATG559	.65	.86	.74	55.37	
PCHST60	.27	.76	.77***	9.79	<.001

***Addition to R^2 p <.001

Summary

An ability measure was obtained for selected years between 1957 and 1972 to study the relationship of ability to school achievement. Ability scores for the period were able to explain or predict 76 to 81 percent of variance in school achievement. In a multivariate analysis combining ability scores with family background and neighborhood factors, ability scores accounted for the largest share of explained variance in a stepwise multiple regression but social class and race added to explained variance in 1970 and social class only added to explained variance in 1960. The 1970 predictive model combining ability scores, social class and race explained 78 percent of variance in school achievement and was statistically significant at better than the .001 level. The 1960 predictive model combining the

ability scores and social class explained 77 percent of variance in school achievement and was statistically significant at better than the .001 level.

CHAPTER VIII

DISCUSSION OF RESULTS

Findings Related to Hypotheses

This research investigated three major hypotheses. The hypotheses investigated were:

H_1--Alternative social class measures will yield similar results as predictors of school achievement.

H_2--Social class measures and other socioeconomic variables (race, education, income, density, and housing value) considered to be important in previous research will be statistically significant predictors of school achievement over three time periods (e.g., 1950, 1960, and 1970).

H_3--Lagging of predictor variables such as social class and other socioeconomic measures will improve or strengthen their relationship with school achievement.

Hypothesis One

Three sets of alternative social class measures based on an adaptation of Edwards' socioeconomic groupings, Havighurst's socioeconomic ratio, and Hodge's social status groupings were analyzed for 1950, 1960, and 1970 as predictors for school achievement for selected years between 1957-1976. Overall, the alternative social class measures yielded simi- results as statistically significant predictors.

The results support Levine et al. (1979) in their finding that lower social status is systematically related to lower school achievement. The Levine et al. (1979) research found several neighborhood characteristics (density, education, housing values, and family structure) to be good predictors of school achievement. However, a direct measure of social class such as used in this study, was not included in the Levine et al. study. This research extends the Levine et al. (1979) work by finding social class (based on occupation) to be a good predictor of school achievement and showing similar results using higher social status and lower social status measures from among three sets of social class measures (Edwards, Havighurst, and Hodges). However, measures indicative of higher social class or status and those indicative of lower social class or status were better predictors than were indicators of middle class status. In 1950 and 1960, the higher social class measures were stronger predictors than in 1970. The lower social class measures were the strongest predictors of school achievement throughout the 1950-1970 period. In 1970, the best lower social class measures explained 67 percent of the variance in 1970 school achievement.

The higher social class measures were positively correlated with school achievement. The higher the percentage in a higher social class grouping in an elementary attendance area, the higher was the school achievement. The lower social

class measures were negatively correlated with school achievement. The higher the percentage in a lower social class grouping, the lower was the school achievement in the elementary attendance area.

The results support Levine et al. (1979) in their assessment that lower social status is systematically related to lower school achievement. This research extends the Levine et al. (1979) research by illustrating three sets of social class measures related to school achievement with generally similar results.

Hypothesis Two

Social class was a statistically significant predictor of school achievement over the three time periods 1950-1970. Also, selected socioeconomic measures found important in previous research were statistically significant predictors of school achievement from 1950-1970. Among the selected socioeconomic measures of race, education, income, density, and housing value, different measures were stronger over the 1950-1970 period. For example, in 1950 and 1960, education was the strongest predictor of school achievement, followed by housing value, income, density and race. By 1970, density and income were the strongest predictors of achievement followed by housing value, race, and education. Education, income and housing value were positively correlated with school achievement, and density and race were negatively correlated.

Hypothesis Three

While social class and other socioeconomic measures were strong predictors of school achievement for 1950, 1960, and 1970, lagging did not improve or strengthen the relationship. Time-lagged variables were statistically significant predictors for 1950, 1960, and 1970 with selected years of school achievement 1957-1976. However, the time-lagged relationship did not result in higher correlations than in the unlagged relationship.

The best 1950 predictors of school achievement throughout the 1957-1976 period were social class (socioeconomic ratio, logged), income, and housing value. The best 1960 and 1970 predictors of school achievement were also social class (percent lower working class, logged), income, and housing value. Even though the results did not entirely support hypothesis three, the research does illustrate that time-lagged variables can be useful as predictors of school achievement.

Kansas City experienced significant changes in several key family background and neighborhood factors between 1950-1970 and in 1957-1976 school achievement. The dynamics of change were studied for selected years in order to examine the relationship of changes in family background and neighborhood factors to changes in school achievement. Alternative periods of change in school achievement were studied with changes in family background and neighborhood factors to

examine time-lagged relationships.

The percent change in social class (percent lower working class) between 1960-1970 explained about 30 percent and the percent change in density explained 15 percent of the percent change in school achievement 1960-1970. The percent change in social class (socioeconomic ratio) between 1950-1970 explained 23 percent, and the percent change in income explained 18 percent of the percent change in school achievement 1957-1976. While controlling for 1960 achievement, the percent change in social class (percent lower working class), the percent change in density (percent housing units vacant), and the percent change in housing value each explained, with 1960 achievement, about 54 percent of variance in percent change in school achievement 1960-1970.

Even though the change relationships were statistically significant predictors of school achievement, change variables alone are not as strong predictors as the other family background and neighborhood factors. The relationships between social class and selected socioeconomic measures with school achievement are not static but are dynamic relationships. Change variables are important in understanding these dynamics but require further analysis. Later in this chapter, an example of this analysis is presented to illustrate the relationship of change variables to other predictors.

The results of the analyses of time-lagged and change variables are interesting and important to educational research. However, this study did not support the contention that time-lagged variables improve or strengthen the predictors' relationship with school achievement.

Findings Related to Other Educational Research

Educational Production Function Studies

This research has focused on the specific measures related to family background and neighborhood factors for consideration in the family background vector of Hanushek's (1979) model of the educational production function. The research has demonstrated the usefulness of three alternative sets of social class measures based on occupation and found similar results. Social class in 1970 was the strongest predictor of school achievement followed by other socioeconomic measures from previous research (density, income, housing value, race and education).

The research also illustrates the strength of innate ability of the student measured through mental ability tests to be a powerful predictor of school achievement. In a multivariate model with social class and other socioeconomic measures, ability scores account for a substantial amount of explained variance, but social class adds a statistically significant amount to explained variance. While ability scores are powerful predictors, the availability of ability

scores to educational or social science researchers may be a problem in some locales in contrast to readily available family background and neighborhood factors from widely published census data.

The data base used in this research generally covers a twenty-year time period of school achievement data and data on family background and neighborhood factors. As an educational production function study, the data base and analysis over a twenty-year period makes the study somewhat unique. However, the results on one city (Kansas City) may not be generalizable to other cities without additional research. This study has addressed methodological issues not fully explored in other research such as specific measures of family background and neighborhood factors to include in the family background vector, the importance of time-lagged variables, and the relationship of change variables in educational production function studies.

Use of Ecological Approach

This research has demonstrated an educational application of the ecological approach. The unit of analysis in this study was the elementary school attendance area. School level measures (e.g., school medians) were analyzed in a correlational study with measures on family background and neighborhood factors from the elementary school attendance area. In Kansas City, the elementary school attendance area was

used as a neighborhood unit for planning purposes during the 1940s, 1950s, and 1960s, so was a useable unit of analysis of this study.

This study also was concerned with the dynamics of neighborhood change and the relationship of this change to school achievement changes. Urban ecological research histirically has studied neighborhood change and the processes of change. Chapters V and VI illustrated how neighborhood change variables are useful in explaining or predicting changes in school achievement. The results demonstrate the importance of change variables in educational research, but the results from this study did not yield significantly stronger predictions than the regular linear and nonlinear relationships.

The importance of change variables to educational research will require further refinements before more substantive findings can be presented. The changes in school achievement can be better predicted by understanding changes occurring in neighborhoods. The persistence of 1960 change predictors in explaining or predicting 1970 school achievement, while controlling for 1960 achievement, suggests that monitoring of neighborhood change could be important for educational policymakers and administrators seeking to explain changes in schools.

Another area of interest in urban ecology has concerned the study of spatial patterns of various social phenomena. In this research, two elementary attendance areas were significantly different from the other areas because of extreme

values or outliers on certain variables. For example, these two attendance areas had very high median incomes, very high median values of owner-occupied housing, and high socio-economic ratios in comparison to other elementary attendance areas.

As discussed in chapter IV, extreme values can affect the results of the correlation analysis where the correlation coefficient may be higher or a curvilinear relationship may appear more pronounced than it is or may appear where none exists. From an ecological perspective, these two elementary attendance areas, even though extreme in these three variables, represent distinct social areas within the city and must be examined in relation to other areas. From a statistical perspective, extreme values should be left out of the analysis because the correlation coefficient and resulting R^2 could produce misleading results. However, leaving two schools out for solely statistical reasons on three variables would tend to imply they should be left out of the entire analysis. Several re-analyses of the relationships reported in this study were conducted to determine the impact of these two schools' extreme values on the basic results, findings, and conclusions. Only results related to income, housing value and socioeconomic ratio were affected and only marginally impacting results (e.g. difference in correlation coefficients ranged from .03 to .10; thus, at most, they only resulted in a 1 percent change in R^2).

The findings and results reported in this study are for all schools including the two elementary attendance areas with extreme values. This does not affect the overall results and conclusions. However, caution should be used in interpreting the statistics presented on the three variables (MDINC, MDVOHU and SER) where outliers exist. Ecologically, the inclusion of the schools in the analysis seems to be the most pragmatic; however these caveats are presented for the reader so the statistics can be interpreted properly.

Choice of Measures

This research used three alternative sets of social class measures and other socioeconomic measures from previous research in studying the relationship of these measures with school achievement. The research demonstrates that the choice of measures can have differing impacts on results achieved over time. For example, the 1950 social class measures indicative of higher social class or status (percent professional, percent high status, socioeconomic ratio) were better predictors of school achievement in 1957. By 1970, the social class measures indicative of lower social class or status (percent laborers, percent lower status, percent lower working class) were better predictors of school achievement than higher status measures. Research focusing on only one measure or indicator for social class could result in misleading results about the importance of social class in explaining school achievement.

This research only tentatively explored the use of time-lagged variables and change variables in educational research. If cities and schools continue to undergo major change, the use of time-lagged and change variables may become important in understanding factors related to school achievement. Confounding issues such as what variables have a lag relationship with achievement, what time lag, and what change variables to include will require further research.

Suppressor Relationships

This research found examples of suppressor relationships among several predictor variables and the criterion variable, especially when change variables were used as predictors. Kukuk et al. (1979) identified a suppressor variable as one which increased the predictive ability of another variable when included in a regression equation. For example, in chapter V, the relationships between alternative social class measures and school achievement were discussed. The expected relationship between the 1960-1970 percent change in social class (percent lower working class) and 1970 school achievement was assumed to be a statistically significant, negative relationship (e.g., the higher the percent change in lower working class, the lower the 1970 school achievement).

A suppressor relationship was found between the 1960-1970 percent change in social class and 1970 school achievement, when the change variable was added to a regression

equation after controlling for 1960 school achievement. The 1960-1970 percent change in social class (percent lower working class) was positively related (r = .48) with 1960 school achievement. This relationship generally indicated that those elementary schools which experienced a high percentage change in social class (percent lower working class) between 1960-1970 were generally high in school achievement in 1960. The 1960 school achievement was positively related to 1970 school achievement (r = .55), indicating those schools which were high in school achievement in 1960 tended to be high in school achievement in 1970. The 1960-1970 percent change in social class (percent lower working class) was not a statistically significant predictor of 1970 school achievement (r = -.10). It may be that no relationship was present because some elementary schools which had a relatively high percent change in percent lower working class were relatively high in school achievement.

However, when controlling for 1960 school achievement, the 1960-1970 percent change in social class (percent lower working class) was a statistically significant predictor of 1970 school achievement, illustrating a suppressor relationship. The suppressor relationship occurred because the 1960-1970 percent change in social class explained relatively little variance in 1970 school achievement until the 1960 school achievement had been taken into account. Suppressor relationships occur in a three-variable model when the relationships

between the predictor variables and dependent variable differ in sign (Kukuk et al., 1979). In this illustration, the 1960-1970 percent change in social class (percent lower working class) could explain only 1 percent variance in 1970 school achievement, while 1960 school achievement explained 30 percent of the variance. However, when the suppressor relationship was examined (e.g., controlling for 1960 school achievement), the change variable (1960-1970 percent change in social class) and suppressor (1960 school achievement) together could explain 47 percent of the var ance in 1970 school achievement. In this example, no direct relationship was present for the whole group of elementary schools between the 1960-1970 change in percent lower working class and 1970 school achievement. However, knowing the 1960 achievement and the 1960-1970 percent change in the percent lower working class enabled an improved prediction of 1970 school achievement. Other examples of suppressor relationships were also present in the analysis and were illustrated briefly in chapters V and VI.

Additional research into these and other suppressor relationships can further the understanding of more complex multivariate models of the relationship between social class and school achievement. This study was exploratory into other methodological issues (time-lagged variables, dynamics of change, and alternative social class measures) but did identify several suppressor relationships which require further analysis.

Thresholds and Concentration of Poverty

Levine et al. (1979) found lower socioeconomic status to be systematically related to lower achievement. This research supports this finding based on an analysis of the relationship between social class and selected socioeconomic measures with school achievement 1957-1976 in Kansas City. Levine et al. (1979, p. 19) noted that indicators of lower socioeconomic status consistently showed curvilinear relationships while indicators of wealth (e.g., income) were linear. In this research, indicators such as the lower social class measures (percent lower working class, percent lower status, and percent laborers) were curvilinear (logarithmic form) while income, education, housing value, and higher social class measures were predominantly linear.

Levine et al. (1979, pp. 20-22) also discussed a point or threshold in lower socioeconomic status measures where lower achievement seemed to be consistently low. Figure 4 illustrates scatter diagrams of a lower social class measures (percent lower working class) in 1960 and 1970 with school achievement in 1960 and 1970. In both 1960 and 1970, when greater than 30 percent of the persons in the neighborhood (elementary attendance area) were in lower working class occupations, the elementary school's achievement level was below grade level. The same threshold was apparent in 1957 school achievement when the 1950 percent lower working class was greater than 30 percent.

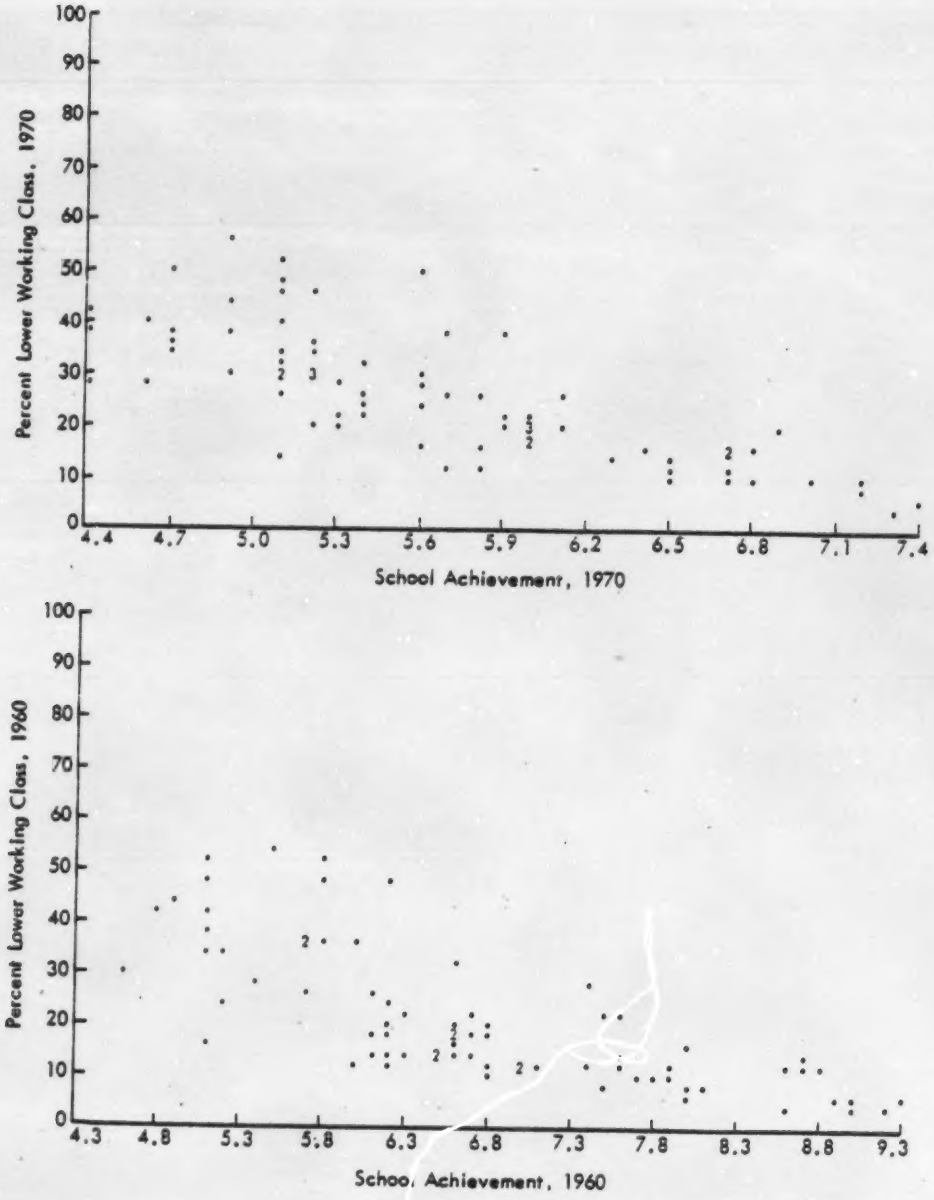

Fig. 4. Scatter diagrams of social class 1960 and 1970 with school achievement 1960 and 1970

Schools with the highest percentages of lower working class (1950, 1960, and 1970) were consistently lower in school achievement (below grade level in 1957, 1960, and 1970). No schools with greater than 30 percent lower working class in the neighborhood in 1950, 1960, or 1970 were above grade level in school achievement in 1957, 1960, or 1970.

Thresholds were consistent for social class even though other major changes were under way in the schools. For example, thresholds for social class remained consistent even as school achievement dropped. In 1970, a larger number of schools (N = 28) were below grade level in school achievement compared to the number of schools in 1957 (N = 16). Also, significant racial change occurred in the schools between 1957-1970 but the thresholds for social class remained. In 1957, only 23 percent of the total elementary enrollment was black and nine schools were greater than 90 percent black. By 1970, the elementary school enrollment was 51 percent black and twenty-four schools were greater than 90 percent black. The thresholds apparent for social class were present for both white and black schools during the 1957-1970 period. Thresholds were not apparent for other measures used in this study except the other lower social class measures (e.g., PCLAB and PCLST).

Levine et al. (1979) found those schools which seemed to be lowest in achievement and above a certain threshold on a lower socioeconomic status indicator were schools faced

with a concentration of poverty. Concentrated poverty schools are ones in which the major socioeconomic indicators all point to high levels of social disorganization in the neighborhoods. Concentration of poverty would indicate low incomes, lower education levels, higher density, lower housing values, and from this study, higher percentages of lower social class. This study has tended to support this thesis.

Stability and Change in Achievement in Big City Schools

One concern of educational production function studies has been the explanation and prediction of stability and change in achievement in big city schools. This research has primarily dealt with the bivariate relationships of alternative social class and other socioeconomic measures with school achievement. However, this section will present, by way of illustration, how the bivariate results might be applied in more complex multivariate models. These findings are at best tentative without additional research. The results of this research will be useful for other studies on the stability and change in achievement in big city schools.

Multivariate analysis of school achievement, 1970

Table 26 contains results of a stepwise multiple regression analysis of school achievement in 1970 combining social class and other socioeconomic measures as predictors.

TABLE 26

STEPWISE MULTIPLE REGRESSION ANALYSIS OF SCHOOL ACHIEVEMENT, 1970 WITH SOCIAL CLASS AND SELECTED SOCIOECONOMIC MEASURES AS PREDICTORS

RCG61970 with	β	r	Cumulative RSQ	F	Level of Significance
LPCLW70	-.43	-.82	.67	12.13	
LPCHUV70	-.32	-.72	.71	10.99	
LPCBK70	-.23	-.66	.73***	6.34	<.001

***Addition to R^2 p <.001

Social class (percent lower working class, logged), density (percent housing units vacant, logged), and race (percent black) explain or predict 73 percent of variance in 1970 school achievement. This predictive model was statistically significant at better than the .001 level. This model crudely illustrates that family background and neighborhood factors can account for a great deal of explained variance in school achievement. Family background and neighborhood factors explain a great deal of variance independent of direct measures of peer influences, school inputs, and innate ability of the student which were not taken into account in the model.

Multivariate analysis of school achievement, 1960

In 1960, a stepwise multiple regression analysis produced similar results to the 1970 model. As shown in table

27, social class (percent lower status, logged) and density (percent housing units vacant, logged) explained or predicted 65 percent of variance in 1960 school achievement. The difference between the 1970 and 1960 predictive models includes the fact that there was less explained variance in the 1960 model and that race was not a statistically significant predictor in that model. This suggests the lower social class measures are the best predictors with density and in 1970, race was also a significant predictor.

TABLE 27

STEPWISE MULTIPLE REGRESSION ANALYSIS OF SCHOOL ACHIEVEMENT, 1960 WITH SOCIAL CLASS AND SELECTED SOCIOECONOMIC MEASURES AS PREDICTORS

PMTO1960 with	β	r	Cumulative RSQ	F	Level of Significance
PCLST60	-.69	-.80	.63	62.34	
LPHUV60	-.18	-.58	.65*	3.99	<.05

*Addition to R^2 p <.05

Multivariate analysis of change in school achievement, 1960-1970

One application of educational production function studies might be to predict the likely changes in school achievement. Table 28 presents an illustration of two predictive models of the percent change in school achievement

1960-1970 with social class and other socioeconomic measures controlling for 1960 achievement. In the first model, social class (socioeconomic ratio), race, and school achievement in 1960 can explain or predict 56 percent of the variance in the percent change in school achievement 1960-1970. In the second model, the percent change in a social class measure (percent laborers) between 1960-1970, and the density, social class, and achievement in 1960 can explain or predict 66 percent of the variance in the percent change in school achievement 1960-1970.

TABLE 28

STEPWISE MULTIPLE REGRESSION ANALYSIS OF SCHOOL ACHIEVEMENT, 1960-1970, CONTROLLING FOR 1960 SCHOOL ACHIEVEMENT, WITH SOCIAL CLASS AND SELECTED SOCIOECONOMIC MEASURES AS PREDICTORS

PCACHG70 with	β	r	Cumulative RSQ	F	Level of Significance
PMTO1960	-.94	-.69	.48	73.25	
SER60	.30	-.14	.54	9.73	
PCBLK60	-.18	.25	.56**	3.57	<.05
PCACHG70 with					
PCLBCH70	-.34	-.52	.27	18.45	
PMTO1960	-.79	-.69	.58	69.20	
PCHUV60	-.24	.16	.64	8.12	
SER60	.19	-.14	.66**	4.76	<.01

**Addition to R^2 p <.01

The second model illustrates the suppressor relationship discussed earlier between the predictor variables. When four variables are taken together (1960 achievement, PCLBCH70, PCHUV60, SER60), the latter two variables are not significant except when in the predictive model in conjunction with the other predictors. The difference in signs between predictors, the fact the latter two variables add significantly to the predictive model, and the low correlations of the latter two predictors with the criterion, all illustrate the suppressor relationship discussed earlier in chapter V.

Summary

Three alternative sets of social class measures (Edwards, Havighurst, and Hodges) were analyzed for 1950, 1960, and 1970 as predictors of 1957-1976 school achievement. Overall, the alternative social classes measures yielded similar results as statistically significant predictors of school achievement. Lower social class measures were the best predictor of school achievement in 1970 and explained 67 percent of the variance in achievement.

Social class and other socioeconomic measures (race, education, income, density, and housing) were statistically significant predictors of school achievement over three time periods from 1950 to 1970. In 1970, socioeconomic measures which were the strongest predictors of school achievement were density and income. While social class and other

socioeconomic measures were strong predictors of school achievement, lagging did not improve or strengthen the relationships. Time-lagged variables were statistically significant predictors of school achievement for 1950, 1960, and 1970 but did not result in higher correlations. Change variables are statistically significant predictors of school achievement but are not as strong as social class and other socioeconomic measures.

This research demonstrated an educational application of the ecological approach. The research also illustrated how the choice of measures can impact the results of educational production function studies and measures may change over time. The research supports Levine et al. (1979) that a threshold exists where lower socioeconomic status was related to lower achievement.

In a multivariate analysis of school achievement in 1970, social class, density, and race explained 73 percent of the variance in 1970 school achievement. In a multivariate analysis of the percent change in school achievement 1960-1970, while controlling for 1960 achievement change in social class the percent change in laborers 1960-1970, density in 1960, and socioeconomic ratio in 1960, explained 66 percent of the variance in percent change in school achievement 1960-1970.

CHAPTER IX

CONCLUSIONS AND IMPLICATIONS

Conclusions

This research was an ecological study of the relationship of social class to school achievement in Kansas City, Missouri. The research addressed the relationship between alternative social class measures (based on occupation) for elementary attendance areas with school achievement represented by the school median on standardized achievement tests for grade six. School achievement data for selected years 1957-1976 were studied using correlation and regression analysis to determine the relationships between alternative social class measures and other selected socioeconomic measures. Methodological issues such as time-lagged variables and the effects of the dynamics of neighborhood change were also explored. This research also explored the relationship between ability scores and achievement, and compared the social class and ability scores as predictors of achievement.

The following may be concluded based on this study:

1. Alternative social class measures 1950-1970 yielded similar results as statistically significant predictors of achievement 1957-1976 in Kansas City. Lower social class measures tended to be the strongest predictors for the

1950-1970 period of school achievement 1957-1976. Higher social class measures were stronger predictors in 1950 and 1960 than in 1970

2. Other socioeconomic measures, from previous research, were statistically significant predictors of school achievement. Different socioeconomic measures were stronger predictors over the 1950-1970 period. For example, in 1950 and 1960, education was the strongest predictor of school achievement followed by housing value, income, density, and race. By 1970, density and income were the strongest predictors followed by housing value, race, and education

3. Time-lagged variables (e.g., lagging of social class and other socioeconomic measures) were statistically significant predictors of school achievement for 1950-1970 but did not result in higher correlations over the unlagged relationship. Change variables (e.g., percent change in achievement and predictor variables) resulted in statistically significant predictions of school achievement but were also less than anticipated

4. The ecological approach was found to be a useful approach for this educational production study

5. Neighborhood change variables were useful in explaining or predicting changes in school achievement. However, further refinements in the use of change variables in educational research will be necessary before more substantive findings can be presented

6. In urban ecological research, one area of interest involves the study of the spatial patterns of social phenomena. Two elementary attendance areas in this study were significantly different from other areas because of extreme values or outliers on three variables (income, housing value, and socioeconomic ratio). These two elementary attendance areas represent distinctive social areas within the city and from an ecological perspective require examination in relation to other areas. However, extreme values tend to affect both the correlation coefficient and resulting R^2, and could produce misleading results. The overall results and conclusions presented in this study include these two schools but their inclusion did not alter the conclusions

7. The research illustrated how the choice of measures can produce misleading results if the measure no longer adequately describes the relationship being studied. This situation occurs when only one measure is chosen with little or no consideration of other measures

8. This research supported Levine et al. (1979) by illustrating that lower social class measures tended to be systematically related to lower school achievement. In Kansas City, elementary school attendance areas with greater than 30 percent lower working class in 1950, 1960, and 1970 were consistently low in school achievement (e.g., below grade level in 1957, 1960, and 1970)

9. In a multivariate analysis of school achievement in 1970, social class, density, race explained or predicted 73 percent of the variance in 1970 school achievement. In a multivariate analysis of the percent change in school achievement 1960-1970, while controlling for 1960 achievement, change in social class 1960-1970 (percent laborers), density in 1960, and socioeconomic ratio in 1960, explained or predicted 66 percent of the variance in the 1960-1970 percent change in achievement. These results tentatively suggest the importance of family background and other neighborhood factors as predictors of school achievement, the use of change variables in conjunction with other predictors, and the effects of lagging predictor variables. However, the relationships between these measures and school achievement are complex and require further detailed analyses to confirm the relationships

10. Also, the research illustrated the importance of ability scores as predictors of school achievement. Ability scores were able to explain or predict 76 to 81 percent of the variance in school achievement for the period. In a multivariate analysis, combining ability scores with family background and neighborhood factors, accounted for the largest share of explained variance in school achievement in both 1960 and 1970. In 1970, social class (percent lower working class, 1970, logged) and race both added significantly to the explained variance in school achievement after ability scores.

In 1960, only social class (percent high status, 1960) added to the explained variance

Implications

This research has produced some interesting, yet incomplete results. Educational production function studies, like much of social science research, raise more questions which require additional research. Research on topics such as the relationship between social class and school achievement will require further refinements and additional analyses.

The findings presented in this dissertation need to be tested in other cities. If the findings are to be generalized beyond the specific time period studied in Kansas City, confirmation will be required from other cities.

This research has shown social class to be a powerful predictor of school achievement along with selected socioeconomic measures. However, when the findings from the bivariate analyses presented here are subjected to additional analyses, the relationships will be better understood with more complex multivariate models. Social class and school achievement are more complex than simple bivariate models. This research has made a contribution to knowledge regarding the relationship between alternative measures and introduced the methodological issues of time lag, change variables, and stability of the predictive models to educational production function research.

In 1980 or 1981, the new Census of Population and Housing will be available. This research should be repeated to examine the 1970-1980 changes in the variables analyzed in this study. The data base on Kansas City prepared in this study contains twenty years of achievement data and three census periods. This data base will allow more detailed analysis of not only the past but will be useful to further research in 1980 or 1981.

Additional research must also be done on time-lagged variables and on how to use change variables. Big-city schools systems have experienced a great deal of change and the trend will probably continue over the next few years. Time-lagged predictors and understanding the effects of change will be important research issues as additional change occurs.

This research focused on family background and neighborhood factors to include in Hanushek's model of the educational production function. Research on alternative measures must also be done in other areas such as peer influences, school inputs, and ability of the student. Much progress has been made, but additional testing of similar methods across several cities is needed.

Good research depends on a good data base. This dissertation and accompanying data may contribute to a base of a longitudinal or cross-temporal nature that needs to be developed. Much of the data presently existing for urban

ecological studies is scattered, not organized into a systematic data base, and often not accessible. One challenge to an urban university interested in teaching, research, and community service is to develop a systematic data base to allow continuing research on the kinds of questions addressed in this dissertation.

Schools are a part of neighborhoods. Neighborhoods collectively comprise a city. A better understanding of the dynamics of neighborhoods and the relationship of these dynamics to the schools will hopefully result in more efficient use of resources of both. The renewal of big-city schools is closely tied to renewal of neighborhoods; renewal of neighborhoods is closely tied to the renewal of the city. Schools can be a positive force in this process or the major impediment inhibiting renewal from occurring. Hopefully, the first posture will be adopted by administrators, decision-makers, teachers, and parents, and they will work collaboratively with the neighborhoods of which they are a part to accomplish this renewal effort.

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